Nos. 24A178, 24A179, 24A180, 24A186, 24A197, 24A199, 24A203

In the Supreme Court of the United States

NACCO NATURAL RESOURCES CORPORATION (NO. 24A178),
WESTMORELAND MINING HOLDINGS LLC et al. (NO. 24A179),
STATE OF NORTH DAKOTA et al. (NO. 24A180),
MIDWEST OZONE GROUP (NO. 24A186),
TALEN MONTANA, LLC & NORTHWESTERN CORPORATION (NO. 24A197),
AMERICA'S POWER & ELECTRIC GENERATORS MATS COALITION (NO. 24A199), and
NATIONAL RURAL ELECTRIC COOPERATIVE ASS'N et al. (NO. 24A203),

Applicants,

v.

ENVIRONMENTAL PROTECTION AGENCY AND MICHAEL S. REGAN, ADMINISTRATOR,

Respondents.

APPENDIX TO

Response of State and Municipal Respondents Massachusetts, Minnesota, Connecticut, Illinois, Maine, Maryland, Michigan, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, Wisconsin, District of Columbia, City of Baltimore, City of Chicago, and the City of New York in Opposition to the Applications for a Stay

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September 13, 2024

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United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 24-1119 **September Term, 2023**

EPA-89FR38508

Filed On: August 6, 2024

State of North Dakota, et al.,

Petitioners

v.

Environmental Protection Agency,

Respondent

San Miguel Electric Cooperative, Inc., et al.,
Intervenors

Consolidated with 24-1154, 24-1179,
24-1184, 24-1190, 24-1194, 24-1201,
24-1217, 24-1223

BEFORE: Henderson, Pan, and Garcia, Circuit Judges

O R D E R

Upon consideration of the motions for stay pending review, the oppositions thereto, the replies, and the Rule 28(j) letter, it is

ORDERED that the motions for stay be denied. Petitioners have not satisfied the stringent requirements for a stay pending court review. See Nken v. Holder, 556 U.S. 418, 434 (2009); D.C. Circuit Handbook of Practice and Internal Procedures 33 (2021). It is

FURTHER ORDERED, on the court's own motion, that the parties submit, within 14 days from the date of this order, proposed formats and schedules for the briefing of these cases. The parties are strongly urged to submit a joint proposal and are reminded that the court looks with extreme disfavor on repetitious submissions and will, where appropriate, require a joint brief of aligned parties with total words not to exceed the standard allotment for a single brief. Whether the parties are aligned or have disparate interests, they must provide detailed justifications for any request to file separate briefs or to exceed in the aggregate the standard word allotment. Requests to exceed the standard word allotment must specify the word allotment necessary for each issue.

Per Curiam

FOR THE COURT:
Mark J. Langer, Clerk

BY: /s/
Selena R. Gancasz
Deputy Clerk

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 24-1119 **September Term, 2023**

EPA-89FR38508

Filed On: August 29, 2024

State of North Dakota, et al.,

Petitioners

v.

Environmental Protection Agency,

Respondent

San Miguel Electric Cooperative, Inc., et al.,
Intervenors

Consolidated with 24-1154, 24-1179,
24-1184, 24-1190, 24-1194, 24-1201,
24-1217, 24-1223

BEFORE: Wilkins, Rao, and Walker, Circuit Judges

O R D E R

Upon consideration of the joint proposed briefing format and schedule, it is

ORDERED that the following briefing format and schedule will apply in these consolidated cases:

Petitioners' Opening Briefs (up to two briefs, not to exceed 24,000 words in the aggregate)	October 1, 2024
Brief of Intervenor Supporting Petitioners (not to exceed 9,100 words)	October 8, 2024
Respondent's Brief (not to exceed 24,000 words)	November 12, 2024

United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

No. 24-1119 **September Term, 2023**

Briefs of Intervenors Supporting Respondent (up to two briefs, not to exceed 9,100 words in the aggregate)	November 19, 2024
Petitioners' Reply Briefs (up to two briefs, not to exceed 12,000 words in the aggregate)	November 26, 2024
Reply Brief of Intervenor Supporting Petitioners (not to exceed 4,550 words)	December 3, 2024
Deferred Appendix	December 6, 2024
Final Briefs	December 10, 2024

The parties will be informed later of the date of oral argument and the composition of the merits panel.

The court reminds the parties that

> In cases involving direct review in this court of administrative actions, the brief of the appellant or petitioner must set forth the basis for the claim of standing. . . . When the appellant's or petitioner's standing is not apparent from the administrative record, the brief must include arguments and evidence establishing the claim of standing.
> See D.C. Cir. Rule 28(a)(7).

Petitioners should raise all issues and arguments in the opening brief. The court ordinarily will not consider issues and arguments raised for the first time in the reply brief.

To enhance the clarity of their briefs, the parties are urged to limit the use of abbreviations, including acronyms. While acronyms may be used for entities and statutes with widely recognized initials, briefs should not contain acronyms that are not widely known. See D.C. Circuit Handbook of Practice and Internal Procedures 43 (2021); Notice Regarding Use of Acronyms (D.C. Cir. Jan. 26, 2010).

Parties are strongly encouraged to hand deliver the paper copies of their briefs to the Clerk's office on the date due. Filing by mail may delay the processing of the brief. Additionally, counsel are reminded that if filing by mail, they must use a class of mail that is at least as expeditious as first-class mail. See Fed. R. App. P. 25(a). All briefs

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No. 24-1119 **September Term, 2023**

and appendices must contain the date that the case is scheduled for oral argument at the top of the cover. See D.C. Cir. Rule 28(a)(8).

Per Curiam

FOR THE COURT:
Mark J. Langer, Clerk

BY: /s/
Selena R. Gancasz
Deputy Clerk

United States Court of Appeals

District of Columbia Circuit
Washington, D.C. 20001-2866

Mark J. Langer
Clerk

(202) 216-7300

NOTICE TO COUNSEL:

SCHEDULING ORAL ARGUMENT

The court has entered an order setting a briefing schedule in a case in which you are counsel of record. Once a briefing order has been entered, the case may be set for oral argument.

You will be notified by separate order of the date and time of oral argument. Once a case has been calendared, the Clerk's Office cannot change the argument date, and ordinarily the court will not reschedule it. Any request to reschedule must be made by motion, which will be presented to a panel of the court for disposition. The court disfavors motions to postpone oral argument and will grant such a motion only upon a showing of "extraordinary cause." See D.C. Cir. Rule 34(g).

If you are the arguing counsel, and you will be unavailable to appear for oral argument on a date in the future, so advise the Clerk's Office by letter, filed electronically. The notification should be filed as soon as possible and updated if a potential scheduling conflict arises later, or if there is any change in availability. To the extent possible, the Clerk's Office will endeavor to schedule oral argument to avoid conflicts that have been brought to the court's attention in advance. See D.C. Circuit Handbook of Practice and Internal Procedures at IX.A.1, XI.A.

Counsel must notify the court when serious settlement negotiations are underway, when settlement of the case becomes likely, and when settlement is reached. Such notice allows for more efficient allocation of judicial resources. Additionally, counsel should promptly notify the court if settlement negotiations are terminated. Notice must be given in an appropriate motion or by letter to the Clerk at the earliest possible moment. See, e.g., D.C. Circuit Handbook of Practice and Internal Procedures at X.D., XI.A.

Rev. March 2017

Pub. L. 95–95, § 109(f), added par. (7) directing that under certain circumstances a conversion to coal not be deemed a modification for purposes of pars. (2) and (4).

Subsec. (a)(7), (8). Pub. L. 95–190, § 14(a)(7), redesignated second par. (7) as (8).

Subsec. (b)(1)(A). Pub. L. 95–95, § 401(b), substituted ''such list if in his judgment it causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger'' for ''such list if he determines it may contribute significantly to air pollution which causes or contributes to the endangerment of''.

Subsec. (b)(1)(B). Pub. L. 95–95, § 109(c)(2), substituted ''shall, at least every four years, review and, if appropriate,'' for ''may, from time to time,''.

Subsec. (b)(5), (6). Pub. L. 95–95, § 109(c)(3), added pars. (5) and (6).

Subsec. (c)(1). Pub. L. 95–95, § 109(d)(1), struck out ''(except with respect to new sources owned or operated by the United States)'' after ''implement and enforce such standards''.

Subsec. (d)(1). Pub. L. 95–95, § 109(b)(1), substituted ''standards of performance'' for ''emission standards'' and inserted provisions directing that regulations of the Administrator permit the State, in applying a standard of performance to any particular source under a submitted plan, to take into consideration, among other factors, the remaining useful life of the existing source to which the standard applies.

Subsec. (d)(2). Pub. L. 95–95, § 109(b)(2), provided that, in promulgating a standard of performance under a plan, the Administrator take into consideration, among other factors, the remaining useful lives of the sources in the category of sources to which the standard applies.

Subsecs. (f) to (i). Pub. L. 95–95, § 109(a), added subsecs. (f) to (i).

Subsecs. (j), (k). Pub. L. 95–190, § 14(a)(8), (9), redesignated subsec. (k) as (j) and, as so redesignated, substituted ''(B)'' for ''(8)'' as designation for second subpar. in par. (2). Former subsec. (j), added by Pub. L. 95–95, § 109(e), which related to compliance with applicable standards of performance, was struck out.

Pub. L. 95–95, § 109(e), added subsec. (k).

1971—Subsec. (b)(1)(B). Pub. L. 92–157 substituted in first sentence ''publish proposed'' for ''propose''.

Statutory Notes and Related Subsidiaries

EFFECTIVE DATE OF 1977 AMENDMENT

Amendment by Pub. L. 95–95 effective Aug. 7, 1977, except as otherwise expressly provided, see section 406(d) of Pub. L. 95–95, set out as a note under section 7401 of this title.

REGULATIONS

Pub. L. 101–549, title IV, § 403(b), (c), Nov. 15, 1990, 104 Stat. 2631, provided that:

''(b) REVISED REGULATIONS.—Not later than three years after the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990], the Administrator shall promulgate revised regulations for standards of performance for new fossil fuel fired electric utility units commencing construction after the date on which such regulations are proposed that, at a minimum, require any source subject to such revised standards to emit sulfur dioxide at a rate not greater than would have resulted from compliance by such source with the applicable standards of performance under this section [amending sections 7411 and 7479 of this title] prior to such revision.

''(c) APPLICABILITY.—The provisions of subsections (a) [amending this section] and (b) apply only so long as the provisions of section 403(e) of the Clean Air Act [42 U.S.C. 7651b(e)] remain in effect.''

PENDING ACTIONS AND PROCEEDINGS

Suits, actions, and other proceedings lawfully commenced by or against the Administrator or any other officer or employee of the United States in his official capacity or in relation to the discharge of his official duties under act July 14, 1955, the Clean Air Act, as in effect immediately prior to the enactment of Pub. L. 95–95 [Aug. 7, 1977], not to abate by reason of the taking effect of Pub. L. 95–95, see section 406(a) of Pub. L. 95–95, set out as an Effective Date of 1977 Amendment note under section 7401 of this title.

MODIFICATION OR RESCISSION OF RULES, REGULATIONS, ORDERS, DETERMINATIONS, CONTRACTS, CERTIFICATIONS, AUTHORIZATIONS, DELEGATIONS, AND OTHER ACTIONS

All rules, regulations, orders, determinations, contracts, certifications, authorizations, delegations, or other actions duly issued, made, or taken by or pursuant to act July 14, 1955, the Clean Air Act, as in effect immediately prior to the date of enactment of Pub. L. 95–95 [Aug. 7, 1977] to continue in full force and effect until modified or rescinded in accordance with act July 14, 1955, as amended by Pub. L. 95–95 [this chapter], see section 406(b) of Pub. L. 95–95, set out as an Effective Date of 1977 Amendment note under section 7401 of this title.

Executive Documents

TRANSFER OF FUNCTIONS

Enforcement functions of Administrator or other official in Environmental Protection Agency related to compliance with new source performance standards under this section with respect to pre-construction, construction, and initial operation of transportation system for Canadian and Alaskan natural gas transferred to Federal Inspector, Office of Federal Inspector for the Alaska Natural Gas Transportation System, until first anniversary of date of initial operation of Alaska Natural Gas Transportation System, see Reorg. Plan No. 1 of 1979, eff. July 1, 1979, §§ 102(a), 203(a), 44 F.R. 33663, 33666, 93 Stat. 1373, 1376, set out in the Appendix to Title 5, Government Organization and Employees. Office of Federal Inspector for the Alaska Natural Gas Transportation System abolished and functions and authority vested in Inspector transferred to Secretary of Energy by section 3012(b) of Pub. L. 102–486, set out as an Abolition of Office of Federal Inspector note under section 719e of Title 15, Commerce and Trade. Functions and authority vested in Secretary of Energy subsequently transferred to Federal Coordinator for Alaska Natural Gas Transportation Projects by section 720d(f) of Title 15.

POWER SECTOR CARBON POLLUTION STANDARDS

Memorandum of President of the United States, June 25, 2013, 78 F.R. 39535, which related to carbon pollution standards for power plants, was revoked by Ex. Ord. No. 13783, § 3(a)(ii), Mar. 28, 2017, 82 F.R. 16094, formerly set out as a note under section 13201 of this title.

§ 7412. Hazardous air pollutants

(a) Definitions

For purposes of this section, except subsection (r)—

(1) Major source

The term ''major source'' means any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants. The Administrator may establish a lesser quantity, or in the case of radionuclides different criteria, for a major source than that specified in the previous sentence, on the basis of the potency of the air pollutant, persistence, potential for bioaccumulation, other characteristics of the air pollutant, or other relevant factors.

(2) Area source

The term ''area source'' means any stationary source of hazardous air pollutants that is not a major source. For purposes of this section, the term ''area source'' shall not include motor vehicles or nonroad vehicles subject to regulation under subchapter II.

(3) Stationary source

The term ''stationary source'' shall have the same meaning as such term has under section 7411(a) of this title.

(4) New source

The term ''new source'' means a stationary source the construction or reconstruction of which is commenced after the Administrator first proposes regulations under this section establishing an emission standard applicable to such source.

(5) Modification

The term ''modification'' means any physical change in, or change in the method of operation of, a major source which increases the actual emissions of any hazardous air pollutant emitted by such source by more than a de minimis amount or which results in the emission of any hazardous air pollutant not previously emitted by more than a de minimis amount.

(6) Hazardous air pollutant

The term ''hazardous air pollutant'' means any air pollutant listed pursuant to subsection (b).

(7) Adverse environmental effect

The term ''adverse environmental effect'' means any significant and widespread adverse effect, which may reasonably be anticipated, to wildlife, aquatic life, or other natural resources, including adverse impacts on populations of endangered or threatened species or significant degradation of environmental quality over broad areas.

(8) Electric utility steam generating unit

The term ''electric utility steam generating unit'' means any fossil fuel fired combustion unit of more than 25 megawatts that serves a generator that produces electricity for sale. A unit that cogenerates steam and electricity and supplies more than one-third of its potential electric output capacity and more than 25 megawatts electrical output to any utility power distribution system for sale shall be considered an electric utility steam generating unit.

(9) Owner or operator

The term ''owner or operator'' means any person who owns, leases, operates, controls, or supervises a stationary source.

(10) Existing source

The term ''existing source'' means any stationary source other than a new source.

(11) Carcinogenic effect

Unless revised, the term ''carcinogenic effect'' shall have the meaning provided by the Administrator under Guidelines for Carcinogenic Risk Assessment as of the date of enactment.[1] Any revisions in the existing Guidelines shall be subject to notice and opportunity for comment.

(b) List of pollutants

(1) Initial list

The Congress establishes for purposes of this section a list of hazardous air pollutants as follows:

CAS number	Chemical name
75070	Acetaldehyde
60355	Acetamide
75058	Acetonitrile
98862	Acetophenone
53963	2-Acetylaminofluorene
107028	Acrolein
79061	Acrylamide
79107	Acrylic acid
107131	Acrylonitrile
107051	Allyl chloride
92671	4-Aminobiphenyl
62533	Aniline
90040	o-Anisidine
1332214	Asbestos
71432	Benzene (including benzene from gasoline)
92875	Benzidine
98077	Benzotrichloride
100447	Benzyl chloride
92524	Biphenyl
117817	Bis(2-ethylhexyl)phthalate (DEHP)
542881	Bis(chloromethyl)ether
75252	Bromoform
106990	1,3-Butadiene
156627	Calcium cyanamide
105602	Caprolactam
133062	Captan
63252	Carbaryl
75150	Carbon disulfide
56235	Carbon tetrachloride
463581	Carbonyl sulfide
120809	Catechol
133904	Chloramben
57749	Chlordane
7782505	Chlorine
79118	Chloroacetic acid
532274	2-Chloroacetophenone
108907	Chlorobenzene
510156	Chlorobenzilate
67663	Chloroform
107302	Chloromethyl methyl ether
126998	Chloroprene
1319773	Cresols/Cresylic acid (isomers and mixture)
95487	o-Cresol
108394	m-Cresol
106445	p-Cresol
98828	Cumene
94757	2,4-D, salts and esters
3547044	DDE
334883	Diazomethane
132649	Dibenzofurans
96128	1,2-Dibromo-3-chloropropane
84742	Dibutylphthalate
106467	1,4-Dichlorobenzene(p)
91941	3,3-Dichlorobenzidene
111444	Dichloroethyl ether (Bis(2-chloroethyl)ether)
542756	1,3-Dichloropropene
62737	Dichlorvos
111422	Diethanolamine

[1] See References in Text note below.

CAS number	Chemical name
121697	N,N-Diethyl aniline (N,N-Dimethylaniline)
64675	Diethyl sulfate
119904	3,3-Dimethoxybenzidine
60117	Dimethyl aminoazobenzene
119937	3,3′-Dimethyl benzidine
79447	Dimethyl carbamoyl chloride
68122	Dimethyl formamide
57147	1,1-Dimethyl hydrazine
131113	Dimethyl phthalate
77781	Dimethyl sulfate
534521	4,6-Dinitro-o-cresol, and salts
51285	2,4-Dinitrophenol
121142	2,4-Dinitrotoluene
123911	1,4-Dioxane (1,4-Diethyleneoxide)
122667	1,2-Diphenylhydrazine
106898	Epichlorohydrin (l-Chloro-2,3-epoxypropane)
106887	1,2-Epoxybutane
140885	Ethyl acrylate
100414	Ethyl benzene
51796	Ethyl carbamate (Urethane)
75003	Ethyl chloride (Chloroethane)
106934	Ethylene dibromide (Dibromoethane)
107062	Ethylene dichloride (1,2-Dichloroethane)
107211	Ethylene glycol
151564	Ethylene imine (Aziridine)
75218	Ethylene oxide
96457	Ethylene thiourea
75343	Ethylidene dichloride (1,1-Dichloroethane)
50000	Formaldehyde
76448	Heptachlor
118741	Hexachlorobenzene
87683	Hexachlorobutadiene
77474	Hexachlorocyclopentadiene
67721	Hexachloroethane
822060	Hexamethylene-1,6-diisocyanate
680319	Hexamethylphosphoramide
110543	Hexane
302012	Hydrazine
7647010	Hydrochloric acid
7664393	Hydrogen fluoride (Hydrofluoric acid)
123319	Hydroquinone
78591	Isophorone
58899	Lindane (all isomers)
108316	Maleic anhydride
67561	Methanol
72435	Methoxychlor
74839	Methyl bromide (Bromomethane)
74873	Methyl chloride (Chloromethane)
71556	Methyl chloroform (1,1,1-Trichloroethane)
78933	Methyl ethyl ketone (2-Butanone)
60344	Methyl hydrazine
74884	Methyl iodide (Iodomethane)
108101	Methyl isobutyl ketone (Hexone)
624839	Methyl isocyanate
80626	Methyl methacrylate
1634044	Methyl tert butyl ether
101144	4,4-Methylene bis(2-chloroaniline)
75092	Methylene chloride (Dichloromethane)
101688	Methylene diphenyl diisocyanate (MDI)
101779	4,4′-Methylenedianiline
91203	Naphthalene
98953	Nitrobenzene
92933	4-Nitrobiphenyl
100027	4-Nitrophenol
79469	2-Nitropropane
684935	N-Nitroso-N-methylurea
62759	N-Nitrosodimethylamine
59892	N-Nitrosomorpholine
56382	Parathion
82688	Pentachloronitrobenzene (Quintobenzene)
87865	Pentachlorophenol
108952	Phenol
106503	p-Phenylenediamine
75445	Phosgene
7803512	Phosphine
7723140	Phosphorus
85449	Phthalic anhydride
1336363	Polychlorinated biphenyls (Aroclors)
1120714	1,3-Propane sultone
57578	beta-Propiolactone
123386	Propionaldehyde
114261	Propoxur (Baygon)
78875	Propylene dichloride (1,2-Dichloropropane)
75569	Propylene oxide
75558	1,2-Propylenimine (2-Methyl aziridine)
91225	Quinoline
106514	Quinone
100425	Styrene
96093	Styrene oxide
1746016	2,3,7,8-Tetrachlorodibenzo-p-dioxin
79345	1,1,2,2-Tetrachloroethane
127184	Tetrachloroethylene (Perchloroethylene)
7550450	Titanium tetrachloride
108883	Toluene
95807	2,4-Toluene diamine
584849	2,4-Toluene diisocyanate
95534	o-Toluidine
8001352	Toxaphene (chlorinated camphene)
120821	1,2,4-Trichlorobenzene
79005	1,1,2-Trichloroethane
79016	Trichloroethylene
95954	2,4,5-Trichlorophenol
88062	2,4,6-Trichlorophenol
121448	Triethylamine
1582098	Trifluralin
540841	2,2,4-Trimethylpentane
108054	Vinyl acetate
593602	Vinyl bromide
75014	Vinyl chloride
75354	Vinylidene chloride (1,1-Dichloroethylene)
1330207	Xylenes (isomers and mixture)
95476	o-Xylenes
108383	m-Xylenes
106423	p-Xylenes
0	Antimony Compounds
0	Arsenic Compounds (inorganic including arsine)
0	Beryllium Compounds
0	Cadmium Compounds
0	Chromium Compounds
0	Cobalt Compounds
0	Coke Oven Emissions
0	Cyanide Compounds [1]
0	Glycol ethers [2]
0	Lead Compounds
0	Manganese Compounds
0	Mercury Compounds
0	Fine mineral fibers [3]
0	Nickel Compounds
0	Polycylic Organic Matter [4]
0	Radionuclides (including radon) [5]
0	Selenium Compounds

NOTE: For all listings above which contain the word ‘‘compounds’’ and for glycol ethers, the following applies: Unless otherwise specified, these listings are defined as including any unique chemical substance that contains the named chemical (i.e., antimony, arsenic, etc.) as part of that chemical's infrastructure.

[1] X′CN where X = H′ or any other group where a formal dissociation may occur. For example KCN or $Ca(CN)_2$.

[2] Includes mono- and di- ethers of ethylene glycol, diethylene glycol, and triethylene glycol R–(OCH2CH2)$_n$–OR′ where

n = 1, 2, or 3

R = alkyl or aryl groups

R′ = R, H, or groups which, when removed, yield glycol ethers with the structure: R–(OCH2CH)$_n$–OH. Polymers are excluded from the glycol category.

[3] Includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.

[4] Includes organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100°C.

[5] A type of atom which spontaneously undergoes radioactive decay.

(2) Revision of the list

The Administrator shall periodically review the list established by this subsection and publish the results thereof and, where appropriate, revise such list by rule, adding pollutants which present, or may present, through inhalation or other routes of exposure, a threat of adverse human health effects (including, but not limited to, substances which are known to be, or may reasonably be anticipated to be, carcinogenic, mutagenic, teratogenic, neurotoxic, which cause reproductive dysfunction, or which are acutely or chronically toxic) or adverse environmental effects whether through ambient concentrations, bioaccumulation, deposition, or otherwise, but not including releases subject to regulation under subsection (r) as a result of emissions to the air. No air pollutant which is listed under section 7408(a) of this title may be added to the list under this section, except that the prohibition of this sentence shall not apply to any pollutant which independently meets the listing criteria of this paragraph and is a precursor to a pollutant which is listed under section 7408(a) of this title or to any pollutant which is in a class of pollutants listed under such section. No substance, practice, process or activity regulated under subchapter VI of this chapter shall be subject to regulation under this section solely due to its adverse effects on the environment.

(3) Petitions to modify the list

(A) Beginning at any time after 6 months after November 15, 1990, any person may petition the Administrator to modify the list of hazardous air pollutants under this subsection by adding or deleting a substance or, in case of listed pollutants without CAS numbers (other than coke oven emissions, mineral fibers, or polycyclic organic matter) removing certain unique substances. Within 18 months after receipt of a petition, the Administrator shall either grant or deny the petition by publishing a written explanation of the reasons for the Administrator's decision. Any such petition shall include a showing by the petitioner that there is adequate data on the health or environmental defects[2] of the pollutant or other evidence adequate to support the petition. The Administrator may not deny a petition solely on the basis of inadequate resources or time for review.

(B) The Administrator shall add a substance to the list upon a showing by the petitioner or on the Administrator's own determination that the substance is an air pollutant and that emissions, ambient concentrations, bioaccumulation or deposition of the substance are known to cause or may reasonably be anticipated to cause adverse effects to human health or adverse environmental effects.

(C) The Administrator shall delete a substance from the list upon a showing by the petitioner or on the Administrator's own determination that there is adequate data on the health and environmental effects of the substance to determine that emissions, ambient concentrations, bioaccumulation or deposition of the substance may not reasonably be anticipated to cause any adverse effects to the human health or adverse environmental effects.

(D) The Administrator shall delete one or more unique chemical substances that contain a listed hazardous air pollutant not having a CAS number (other than coke oven emissions, mineral fibers, or polycyclic organic matter) upon a showing by the petitioner or on the Administrator's own determination that such unique chemical substances that contain the named chemical of such listed hazardous air pollutant meet the deletion requirements of subparagraph (C). The Administrator must grant or deny a deletion petition prior to promulgating any emission standards pursuant to subsection (d) applicable to any source category or subcategory of a listed hazardous air pollutant without a CAS number listed under subsection (b) for which a deletion petition has been filed within 12 months of November 15, 1990.

(4) Further information

If the Administrator determines that information on the health or environmental effects of a substance is not sufficient to make a determination required by this subsection, the Administrator may use any authority available to the Administrator to acquire such information.

(5) Test methods

The Administrator may establish, by rule, test measures and other analytic procedures for monitoring and measuring emissions, ambient concentrations, deposition, and bioaccumulation of hazardous air pollutants.

(6) Prevention of significant deterioration

The provisions of part C (prevention of significant deterioration) shall not apply to pollutants listed under this section.

(7) Lead

The Administrator may not list elemental lead as a hazardous air pollutant under this subsection.

(c) List of source categories

(1) In general

Not later than 12 months after November 15, 1990, the Administrator shall publish, and shall from time to time, but no less often than every 8 years, revise, if appropriate, in response to public comment or new information, a list of all categories and subcategories of major sources and area sources (listed under paragraph (3)) of the air pollutants listed pursuant to subsection (b). To the extent practicable, the categories and subcategories listed under this subsection shall be consistent with the list of source categories established pursuant to section 7411 of this title and part C. Nothing in the preceding sentence limits the Administrator's authority to establish subcategories under this section, as appropriate.

(2) Requirement for emissions standards

For the categories and subcategories the Administrator lists, the Administrator shall es-

[2] So in original. Probably should be "effects".

tablish emissions standards under subsection (d), according to the schedule in this subsection and subsection (e).

(3) Area sources

The Administrator shall list under this subsection each category or subcategory of area sources which the Administrator finds presents a threat of adverse effects to human health or the environment (by such sources individually or in the aggregate) warranting regulation under this section. The Administrator shall, not later than 5 years after November 15, 1990, and pursuant to subsection (k)(3)(B), list, based on actual or estimated aggregate emissions of a listed pollutant or pollutants, sufficient categories or subcategories of area sources to ensure that area sources representing 90 percent of the area source emissions of the 30 hazardous air pollutants that present the greatest threat to public health in the largest number of urban areas are subject to regulation under this section. Such regulations shall be promulgated not later than 10 years after November 15, 1990.

(4) Previously regulated categories

The Administrator may, in the Administrator's discretion, list any category or subcategory of sources previously regulated under this section as in effect before November 15, 1990.

(5) Additional categories

In addition to those categories and subcategories of sources listed for regulation pursuant to paragraphs (1) and (3), the Administrator may at any time list additional categories and subcategories of sources of hazardous air pollutants according to the same criteria for listing applicable under such paragraphs. In the case of source categories and subcategories listed after publication of the initial list required under paragraph (1) or (3), emission standards under subsection (d) for the category or subcategory shall be promulgated within 10 years after November 15, 1990, or within 2 years after the date on which such category or subcategory is listed, whichever is later.

(6) Specific pollutants

With respect to alkylated lead compounds, polycyclic organic matter, hexachlorobenzene, mercury, polychlorinated biphenyls, 2,3,7,8-tetrachlorodibenzofurans and 2,3,7,8-tetrachlorodibenzo-p-dioxin, the Administrator shall, not later than 5 years after November 15, 1990, list categories and subcategories of sources assuring that sources accounting for not less than 90 per centum of the aggregate emissions of each such pollutant are subject to standards under subsection (d)(2) or (d)(4). Such standards shall be promulgated not later than 10 years after November 15, 1990. This paragraph shall not be construed to require the Administrator to promulgate standards for such pollutants emitted by electric utility steam generating units.

(7) Research facilities

The Administrator shall establish a separate category covering research or laboratory facilities, as necessary to assure the equitable treatment of such facilities. For purposes of this section, ''research or laboratory facility'' means any stationary source whose primary purpose is to conduct research and development into new processes and products, where such source is operated under the close supervision of technically trained personnel and is not engaged in the manufacture of products for commercial sale in commerce, except in a de minimis manner.

(8) Boat manufacturing

When establishing emissions standards for styrene, the Administrator shall list boat manufacturing as a separate subcategory unless the Administrator finds that such listing would be inconsistent with the goals and requirements of this chapter.

(9) Deletions from the list

(A) Where the sole reason for the inclusion of a source category on the list required under this subsection is the emission of a unique chemical substance, the Administrator shall delete the source category from the list if it is appropriate because of action taken under either subparagraphs (C) or (D) of subsection (b)(3).

(B) The Administrator may delete any source category from the list under this subsection, on petition of any person or on the Administrator's own motion, whenever the Administrator makes the following determination or determinations, as applicable:

(i) In the case of hazardous air pollutants emitted by sources in the category that may result in cancer in humans, a determination that no source in the category (or group of sources in the case of area sources) emits such hazardous air pollutants in quantities which may cause a lifetime risk of cancer greater than one in one million to the individual in the population who is most exposed to emissions of such pollutants from the source (or group of sources in the case of area sources).

(ii) In the case of hazardous air pollutants that may result in adverse health effects in humans other than cancer or adverse environmental effects, a determination that emissions from no source in the category or subcategory concerned (or group of sources in the case of area sources) exceed a level which is adequate to protect public health with an ample margin of safety and no adverse environmental effect will result from emissions from any source (or from a group of sources in the case of area sources).

The Administrator shall grant or deny a petition under this paragraph within 1 year after the petition is filed.

(d) Emission standards

(1) In general

The Administrator shall promulgate regulations establishing emission standards for each category or subcategory of major sources and area sources of hazardous air pollutants listed for regulation pursuant to subsection (c) in accordance with the schedules provided in subsections (c) and (e). The Administrator may distinguish among classes, types, and sizes of sources within a category or subcategory in establishing such standards except that, there shall be no delay in the compliance date for any standard applicable to any source under subsection (i) as the result of the authority provided by this sentence.

(2) Standards and methods

Emissions standards promulgated under this subsection and applicable to new or existing sources of hazardous air pollutants shall require the maximum degree of reduction in emissions of the hazardous air pollutants subject to this section (including a prohibition on such emissions, where achievable) that the Administrator, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines is achievable for new or existing sources in the category or subcategory to which such emission standard applies, through application of measures, processes, methods, systems or techniques including, but not limited to, measures which—

(A) reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitution of materials or other modifications,

(B) enclose systems or processes to eliminate emissions,

(C) collect, capture or treat such pollutants when released from a process, stack, storage or fugitive emissions point,

(D) are design, equipment, work practice, or operational standards (including requirements for operator training or certification) as provided in subsection (h), or

(E) are a combination of the above.

None of the measures described in subparagraphs (A) through (D) shall, consistent with the provisions of section 7414(c) of this title, in any way compromise any United States patent or United States trademark right, or any confidential business information, or any trade secret or any other intellectual property right.

(3) New and existing sources

The maximum degree of reduction in emissions that is deemed achievable for new sources in a category or subcategory shall not be less stringent than the emission control that is achieved in practice by the best controlled similar source, as determined by the Administrator. Emission standards promulgated under this subsection for existing sources in a category or subcategory may be less stringent than standards for new sources in the same category or subcategory but shall not be less stringent, and may be more stringent than—

(A) the average emission limitation achieved by the best performing 12 percent of the existing sources (for which the Administrator has emissions information), excluding those sources that have, within 18 months before the emission standard is proposed or within 30 months before such standard is promulgated, whichever is later, first achieved a level of emission rate or emission reduction which complies, or would comply if the source is not subject to such standard, with the lowest achievable emission rate (as defined by section 7501 of this title) applicable to the source category and prevailing at the time, in the category or subcategory for categories and subcategories with 30 or more sources, or

(B) the average emission limitation achieved by the best performing 5 sources (for which the Administrator has or could reasonably obtain emissions information) in the category or subcategory for categories or subcategories with fewer than 30 sources.

(4) Health threshold

With respect to pollutants for which a health threshold has been established, the Administrator may consider such threshold level, with an ample margin of safety, when establishing emission standards under this subsection.

(5) Alternative standard for area sources

With respect only to categories and subcategories of area sources listed pursuant to subsection (c), the Administrator may, in lieu of the authorities provided in paragraph (2) and subsection (f), elect to promulgate standards or requirements applicable to sources in such categories or subcategories which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.

(6) Review and revision

The Administrator shall review, and revise as necessary (taking into account developments in practices, processes, and control technologies), emission standards promulgated under this section no less often than every 8 years.

(7) Other requirements preserved

No emission standard or other requirement promulgated under this section shall be interpreted, construed or applied to diminish or replace the requirements of a more stringent emission limitation or other applicable requirement established pursuant to section 7411 of this title, part C or D, or other authority of this chapter or a standard issued under State authority.

(8) Coke ovens

(A) Not later than December 31, 1992, the Administrator shall promulgate regulations establishing emission standards under paragraphs (2) and (3) of this subsection for coke oven batteries. In establishing such standards, the Administrator shall evaluate—

(i) the use of sodium silicate (or equivalent) luting compounds to prevent door leaks, and other operating practices and technologies for their effectiveness in reducing coke oven emissions, and their suitability for use on new and existing coke oven batteries, taking into account costs and reasonable commercial door warranties; and

(ii) as a basis for emission standards under this subsection for new coke oven batteries that begin construction after the date of proposal of such standards, the Jewell design Thompson non-recovery coke oven batteries and other non-recovery coke oven technologies, and other appropriate emission control and coke production technologies, as to their effectiveness in reducing coke oven emissions and their capability for production of steel quality coke.

Such regulations shall require at a minimum that coke oven batteries will not exceed 8 per centum leaking doors, 1 per centum leaking lids, 5 per centum leaking offtakes, and 16 seconds visible emissions per charge, with no exclusion for emissions during the period after the closing of self-sealing oven doors. Notwithstanding subsection (i), the compliance date for such emission standards for existing coke oven batteries shall be December 31, 1995.

(B) The Administrator shall promulgate work practice regulations under this subsection for coke oven batteries requiring, as appropriate—

(i) the use of sodium silicate (or equivalent) luting compounds, if the Administrator determines that use of sodium silicate is an effective means of emissions control and is achievable, taking into account costs and reasonable commercial warranties for doors and related equipment; and

(ii) door and jam cleaning practices.

Notwithstanding subsection (i), the compliance date for such work practice regulations for coke oven batteries shall be not later than the date 3 years after November 15, 1990.

(C) For coke oven batteries electing to qualify for an extension of the compliance date for standards promulgated under subsection (f) in accordance with subsection (i)(8), the emission standards under this subsection for coke oven batteries shall require that coke oven batteries not exceed 8 per centum leaking doors, 1 per centum leaking lids, 5 per centum leaking offtakes, and 16 seconds visible emissions per charge, with no exclusion for emissions during the period after the closing of self-sealing doors. Notwithstanding subsection (i), the compliance date for such emission standards for existing coke oven batteries seeking an extension shall be not later than the date 3 years after November 15, 1990.

(9) Sources licensed by the Nuclear Regulatory Commission

No standard for radionuclide emissions from any category or subcategory of facilities licensed by the Nuclear Regulatory Commission (or an Agreement State) is required to be promulgated under this section if the Administrator determines, by rule, and after consultation with the Nuclear Regulatory Commission, that the regulatory program established by the Nuclear Regulatory Commission pursuant to the Atomic Energy Act [42 U.S.C. 2011 et seq.] for such category or subcategory provides an ample margin of safety to protect the public health. Nothing in this subsection shall preclude or deny the right of any State or political subdivision thereof to adopt or enforce any standard or limitation respecting emissions of radionuclides which is more stringent than the standard or limitation in effect under section 7411 of this title or this section.

(10) Effective date

Emission standards or other regulations promulgated under this subsection shall be effective upon promulgation.

(e) Schedule for standards and review

(1) In general

The Administrator shall promulgate regulations establishing emission standards for categories and subcategories of sources initially listed for regulation pursuant to subsection (c)(1) as expeditiously as practicable, assuring that—

(A) emission standards for not less than 40 categories and subcategories (not counting coke oven batteries) shall be promulgated not later than 2 years after November 15, 1990;

(B) emission standards for coke oven batteries shall be promulgated not later than December 31, 1992;

(C) emission standards for 25 per centum of the listed categories and subcategories shall be promulgated not later than 4 years after November 15, 1990;

(D) emission standards for an additional 25 per centum of the listed categories and subcategories shall be promulgated not later than 7 years after November 15, 1990; and

(E) emission standards for all categories and subcategories shall be promulgated not later than 10 years after November 15, 1990.

(2) Priorities

In determining priorities for promulgating standards under subsection (d), the Administrator shall consider—

(A) the known or anticipated adverse effects of such pollutants on public health and the environment;

(B) the quantity and location of emissions or reasonably anticipated emissions of hazardous air pollutants that each category or subcategory will emit; and

(C) the efficiency of grouping categories or subcategories according to the pollutants emitted, or the processes or technologies used.

(3) Published schedule

Not later than 24 months after November 15, 1990, and after opportunity for comment, the Administrator shall publish a schedule establishing a date for the promulgation of emission standards for each category and subcategory of sources listed pursuant to subsection (c)(1) and (3) which shall be consistent with the requirements of paragraphs (1) and (2). The determination of priorities for the promulgation of standards pursuant to this paragraph is not a rulemaking and shall not be subject to judicial review, except that, failure to promulgate any standard pursuant to the schedule established by this paragraph shall be subject to review under section 7604 of this title.

(4) Judicial review

Notwithstanding section 7607 of this title, no action of the Administrator adding a pollutant to the list under subsection (b) or listing a source category or subcategory under subsection (c) shall be a final agency action subject to judicial review, except that any such action may be reviewed under such section 7607 of this title when the Administrator issues emission standards for such pollutant or category.

(5) Publicly owned treatment works

The Administrator shall promulgate standards pursuant to subsection (d) applicable to publicly owned treatment works (as defined in title II of the Federal Water Pollution Control Act [33 U.S.C. 1281 et seq.]) not later than 5 years after November 15, 1990.

(f) Standard to protect health and environment

(1) Report

Not later than 6 years after November 15, 1990, the Administrator shall investigate and report, after consultation with the Surgeon General and after opportunity for public comment, to Congress on—

(A) methods of calculating the risk to public health remaining, or likely to remain, from sources subject to regulation under this section after the application of standards under subsection (d);

(B) the public health significance of such estimated remaining risk and the technologically and commercially available methods and costs of reducing such risks;

(C) the actual health effects with respect to persons living in the vicinity of sources, any available epidemiological or other health studies, risks presented by background concentrations of hazardous air pollutants, any uncertainties in risk assessment methodology or other health assessment technique, and any negative health or environmental consequences to the community of efforts to reduce such risks; and

(D) recommendations as to legislation regarding such remaining risk.

(2) Emission standards

(A) If Congress does not act on any recommendation submitted under paragraph (1), the Administrator shall, within 8 years after promulgation of standards for each category or subcategory of sources pursuant to subsection (d), promulgate standards for such category or subcategory if promulgation of such standards is required in order to provide an ample margin of safety to protect public health in accordance with this section (as in effect before November 15, 1990) or to prevent, taking into consideration costs, energy, safety, and other relevant factors, an adverse environmental effect. Emission standards promulgated under this subsection shall provide an ample margin of safety to protect public health in accordance with this section (as in effect before November 15, 1990), unless the Administrator determines that a more stringent standard is necessary to prevent, taking into consideration costs, energy, safety, and other relevant factors, an adverse environmental effect. If standards promulgated pursuant to subsection (d) and applicable to a category or subcategory of sources emitting a pollutant (or pollutants) classified as a known, probable or possible human carcinogen do not reduce lifetime excess cancer risks to the individual most exposed to emissions from a source in the category or subcategory to less than one in one million, the Administrator shall promulgate standards under this subsection for such source category.

(B) Nothing in subparagraph (A) or in any other provision of this section shall be construed as affecting, or applying to the Administrator's interpretation of this section, as in effect before November 15, 1990, and set forth in the Federal Register of September 14, 1989 (54 Federal Register 38044).

(C) The Administrator shall determine whether or not to promulgate such standards and, if the Administrator decides to promulgate such standards, shall promulgate the standards 8 years after promulgation of the standards under subsection (d) for each source category or subcategory concerned. In the case of categories or subcategories for which standards under subsection (d) are required to be promulgated within 2 years after November 15, 1990, the Administrator shall have 9 years after promulgation of the standards under subsection (d) to make the determination under the preceding sentence and, if required, to promulgate the standards under this paragraph.

(3) Effective date

Any emission standard established pursuant to this subsection shall become effective upon promulgation.

(4) Prohibition

No air pollutant to which a standard under this subsection applies may be emitted from any stationary source in violation of such standard, except that in the case of an existing source—

(A) such standard shall not apply until 90 days after its effective date, and

(B) the Administrator may grant a waiver permitting such source a period of up to 2 years after the effective date of a standard to comply with the standard if the Administrator finds that such period is necessary for the installation of controls and that steps will be taken during the period of the waiver to assure that the health of persons will be protected from imminent endangerment.

(5) Area sources

The Administrator shall not be required to conduct any review under this subsection or promulgate emission limitations under this subsection for any category or subcategory of area sources that is listed pursuant to subsection (c)(3) and for which an emission standard is promulgated pursuant to subsection (d)(5).

(6) Unique chemical substances

In establishing standards for the control of unique chemical substances of listed pollutants without CAS numbers under this subsection, the Administrator shall establish such standards with respect to the health and environmental effects of the substances actually emitted by sources and direct transformation byproducts of such emissions in the categories and subcategories.

(g) Modifications

(1) Offsets

(A) A physical change in, or change in the method of operation of, a major source which results in a greater than de minimis increase in actual emissions of a hazardous air pollutant shall not be considered a modification, if such increase in the quantity of actual emissions of any hazardous air pollutant from such source will be offset by an equal or greater decrease in the quantity of emissions of another hazardous air pollutant (or pollutants) from such source which is deemed more hazardous, pursuant to guidance issued by the Administrator under subparagraph (B). The owner or operator of such source shall submit a showing to the Administrator (or the State) that such increase has been offset under the preceding sentence.

(B) The Administrator shall, after notice and opportunity for comment and not later than 18 months after November 15, 1990, publish guidance with respect to implementation of this subsection. Such guidance shall include an identification, to the extent practicable, of the relative hazard to human health resulting from emissions to the ambient air of each of the pollutants listed under subsection (b) sufficient to facilitate the offset showing authorized by subparagraph (A). Such guidance shall not authorize offsets between pollutants where the increased pollutant (or more than one pollutant in a stream of pollutants) causes adverse effects to human health for which no safety threshold for exposure can be determined unless there are corresponding decreases in such types of pollutant(s).

(2) Construction, reconstruction and modifications

(A) After the effective date of a permit program under subchapter V in any State, no person may modify a major source of hazardous air pollutants in such State, unless the Administrator (or the State) determines that the maximum achievable control technology emission limitation under this section for existing sources will be met. Such determination shall be made on a case-by-case basis where no applicable emissions limitations have been established by the Administrator.

(B) After the effective date of a permit program under subchapter V in any State, no person may construct or reconstruct any major source of hazardous air pollutants, unless the Administrator (or the State) determines that the maximum achievable control technology emission limitation under this section for new sources will be met. Such determination shall be made on a case-by-case basis where no applicable emission limitations have been established by the Administrator.

(3) Procedures for modifications

The Administrator (or the State) shall establish reasonable procedures for assuring that the requirements applying to modifications under this section are reflected in the permit.

(h) Work practice standards and other requirements

(1) In general

For purposes of this section, if it is not feasible in the judgment of the Administrator to prescribe or enforce an emission standard for control of a hazardous air pollutant or pollutants, the Administrator may, in lieu thereof, promulgate a design, equipment, work practice, or operational standard, or combination thereof, which in the Administrator's judgment is consistent with the provisions of subsection (d) or (f). In the event the Administrator promulgates a design or equipment standard under this subsection, the Administrator shall include as part of such standard such requirements as will assure the proper operation and maintenance of any such element of design or equipment.

(2) Definition

For the purpose of this subsection, the phrase "not feasible to prescribe or enforce an emission standard" means any situation in which the Administrator determines that—

(A) a hazardous air pollutant or pollutants cannot be emitted through a conveyance designed and constructed to emit or capture such pollutant, or that any requirement for, or use of, such a conveyance would be inconsistent with any Federal, State or local law, or

(B) the application of measurement methodology to a particular class of sources is not practicable due to technological and economic limitations.

(3) Alternative standard

If after notice and opportunity for comment, the owner or operator of any source establishes to the satisfaction of the Administrator that an alternative means of emission limitation will achieve a reduction in emissions of any air pollutant at least equivalent to the reduction in emissions of such pollutant achieved under the requirements of paragraph (1), the Administrator shall permit the use of such alternative by the source for purposes of compliance with this section with respect to such pollutant.

(4) Numerical standard required

Any standard promulgated under paragraph (1) shall be promulgated in terms of an emission standard whenever it is feasible to promulgate and enforce a standard in such terms.

(i) Schedule for compliance

(1) Preconstruction and operating requirements

After the effective date of any emission standard, limitation, or regulation under subsection (d), (f) or (h), no person may construct any new major source or reconstruct any existing major source subject to such emission standard, regulation or limitation unless the Administrator (or a State with a permit program approved under subchapter V) determines that such source, if properly constructed, reconstructed and operated, will comply with the standard, regulation or limitation.

(2) Special rule

Notwithstanding the requirements of paragraph (1), a new source which commences construction or reconstruction after a standard, limitation or regulation applicable to such source is proposed and before such standard, limitation or regulation is promulgated shall not be required to comply with such promulgated standard until the date 3 years after the date of promulgation if—

(A) the promulgated standard, limitation or regulation is more stringent than the standard, limitation or regulation proposed; and

(B) the source complies with the standard, limitation, or regulation as proposed during the 3-year period immediately after promulgation.

(3) Compliance schedule for existing sources

(A) After the effective date of any emissions standard, limitation or regulation promulgated under this section and applicable to a source, no person may operate such source in violation of such standard, limitation or regulation except, in the case of an existing source, the Administrator shall establish a compliance date or dates for each category or subcategory of existing sources, which shall provide for compliance as expeditiously as practicable, but in no event later than 3 years after the effective date of such standard, except as provided in subparagraph (B) and paragraphs (4) through (8).

(B) The Administrator (or a State with a program approved under subchapter V) may issue a permit that grants an extension permitting an existing source up to 1 additional year to comply with standards under subsection (d) if such additional period is necessary for the installation of controls. An additional extension of up to 3 years may be added for mining waste operations, if the 4-year compliance time is insufficient to dry and cover mining waste in order to reduce emissions of any pollutant listed under subsection (b).

(4) Presidential exemption

The President may exempt any stationary source from compliance with any standard or limitation under this section for a period of not more than 2 years if the President determines that the technology to implement such standard is not available and that it is in the national security interests of the United States to do so. An exemption under this paragraph may be extended for 1 or more additional periods, each period not to exceed 2 years. The President shall report to Congress with respect to each exemption (or extension thereof) made under this paragraph.

(5) Early reduction

(A) The Administrator (or a State acting pursuant to a permit program approved under subchapter V) shall issue a permit allowing an existing source, for which the owner or operator demonstrates that the source has achieved a reduction of 90 per centum or more in emissions of hazardous air pollutants (95 per centum in the case of hazardous air pollutants which are particulates) from the source, to meet an alternative emission limitation reflecting such reduction in lieu of an emission limitation promulgated under subsection (d) for a period of 6 years from the compliance date for the otherwise applicable standard, provided that such reduction is achieved before the otherwise applicable standard under subsection (d) is first proposed. Nothing in this paragraph shall preclude a State from requiring reductions in excess of those specified in this subparagraph as a condition of granting the extension authorized by the previous sentence.

(B) An existing source which achieves the reduction referred to in subparagraph (A) after the proposal of an applicable standard but before January 1, 1994, may qualify under subparagraph (A), if the source makes an enforceable commitment to achieve such reduction before the proposal of the standard. Such commitment shall be enforceable to the same extent as a regulation under this section.

(C) The reduction shall be determined with respect to verifiable and actual emissions in a base year not earlier than calendar year 1987, provided that, there is no evidence that emissions in the base year are artificially or substantially greater than emissions in other years prior to implementation of emissions reduction measures. The Administrator may allow a source to use a baseline year of 1985 or 1986 provided that the source can demonstrate to the satisfaction of the Administrator that emissions data for the source reflects verifiable data based on information for such source, received by the Administrator prior to November 15, 1990, pursuant to an information request issued under section 7414 of this title.

(D) For each source granted an alternative emission limitation under this paragraph there shall be established by a permit issued pursuant to subchapter V an enforceable emission limitation for hazardous air pollutants reflecting the reduction which qualifies the source for an alternative emission limitation under this paragraph. An alternative emission limitation under this paragraph shall not be available with respect to standards or requirements promulgated pursuant to subsection (f) and the Administrator shall, for the purpose of determining whether a standard under subsection (f) is necessary, review emissions from sources granted an alternative emission limitation under this paragraph at the same time that other sources in the category or subcategory are reviewed.

(E) With respect to pollutants for which high risks of adverse public health effects may be associated with exposure to small quantities including, but not limited to, chlorinated dioxins and furans, the Administrator shall by regulation limit the use of offsetting reductions in emissions of other hazardous air pollutants from the source as counting toward the 90 per centum reduction in such high-risk pollutants qualifying for an alternative emissions limitation under this paragraph.

(6) Other reductions

Notwithstanding the requirements of this section, no existing source that has installed—

(A) best available control technology (as defined in section 7479(3) of this title), or

(B) technology required to meet a lowest achievable emission rate (as defined in section 7501 of this title),

prior to the promulgation of a standard under this section applicable to such source and the same pollutant (or stream of pollutants) controlled pursuant to an action described in subparagraph (A) or (B) shall be required to comply with such standard under this section until the date 5 years after the date on which such installation or reduction has been achieved, as determined by the Administrator. The Administrator may issue such rules and guidance as are necessary to implement this paragraph.

(7) Extension for new sources

A source for which construction or reconstruction is commenced after the date an emission standard applicable to such source is proposed pursuant to subsection (d) but before the date an emission standard applicable to such source is proposed pursuant to subsection (f) shall not be required to comply with the emission standard under subsection (f) until the date 10 years after the date construction or reconstruction is commenced.

(8) Coke ovens

(A) Any coke oven battery that complies with the emission limitations established under subsection (d)(8)(C), subparagraph (B), and subparagraph (C), and complies with the provisions of subparagraph (E), shall not be required to achieve emission limitations promulgated under subsection (f) until January 1, 2020.

(B)(i) Not later than December 31, 1992, the Administrator shall promulgate emission limitations for coke oven emissions from coke oven batteries. Notwithstanding paragraph (3) of this subsection, the compliance date for such emission limitations for existing coke oven batteries shall be January 1, 1998. Such emission limitations shall reflect the lowest achievable emission rate as defined in section 7501 of this title for a coke oven battery that is rebuilt or a replacement at a coke oven plant for an existing battery. Such emission limitations shall be no less stringent than—

(I) 3 per centum leaking doors (5 per centum leaking doors for six meter batteries);

(II) 1 per centum leaking lids;

(III) 4 per centum leaking offtakes; and

(IV) 16 seconds visible emissions per charge,

with an exclusion for emissions during the period after the closing of self-sealing oven doors (or the total mass emissions equivalent). The rulemaking in which such emission limitations are promulgated shall also establish an appropriate measurement methodology for determining compliance with such emission limitations, and shall establish such emission limitations in terms of an equivalent level of mass emissions reduction from a coke oven battery, unless the Administrator finds that such a mass emissions standard would not be practicable or enforceable. Such measurement methodology, to the extent it measures leaking doors, shall take into consideration alternative test methods that reflect the best technology and practices actually applied in the affected industries, and shall assure that the final test methods are consistent with the performance of such best technology and practices.

(ii) If the Administrator fails to promulgate such emission limitations under this subparagraph prior to the effective date of such emission limitations, the emission limitations applicable to coke oven batteries under this subparagraph shall be—

(I) 3 per centum leaking doors (5 per centum leaking doors for six meter batteries);

(II) 1 per centum leaking lids;

(III) 4 per centum leaking offtakes; and

(IV) 16 seconds visible emissions per charge,

or the total mass emissions equivalent (if the total mass emissions equivalent is determined to be practicable and enforceable), with no exclusion for emissions during the period after the closing of self-sealing oven doors.

(C) Not later than January 1, 2007, the Administrator shall review the emission limitations promulgated under subparagraph (B) and revise, as necessary, such emission limitations to reflect the lowest achievable emission rate as defined in section 7501 of this title at the time for a coke oven battery that is rebuilt or a replacement at a coke oven plant for an existing battery. Such emission limitations shall be no less stringent than the emission limitation promulgated under subparagraph (B). Notwithstanding paragraph (2) of this subsection, the compliance date for such emission limitations for existing coke oven batteries shall be January 1, 2010.

(D) At any time prior to January 1, 1998, the owner or operator of any coke oven battery may elect to comply with emission limitations promulgated under subsection (f) by the date such emission limitations would otherwise apply to such coke oven battery, in lieu of the emission limitations and the compliance dates provided under subparagraphs (B) and (C) of this paragraph. Any such owner or operator shall be legally bound to comply with such emission limitations promulgated under subsection (f) with respect to such coke oven battery as of January 1, 2003. If no such emission limitations have been promulgated for such coke oven battery, the Administrator shall promulgate such emission limitations in accordance with subsection (f) for such coke oven battery.

(E) Coke oven batteries qualifying for an extension under subparagraph (A) shall make available not later than January 1, 2000, to the surrounding communities the results of any risk assessment performed by the Administrator to determine the appropriate level of any emission standard established by the Administrator pursuant to subsection (f).

(F) Notwithstanding the provisions of this section, reconstruction of any source of coke oven emissions qualifying for an extension under this paragraph shall not subject such source to emission limitations under subsection (f) more stringent than those established under subparagraphs (B) and (C) until January 1, 2020. For the purposes of this subparagraph, the term ''reconstruction'' includes the replacement of existing coke oven battery capacity with new coke oven batteries of comparable or lower capacity and lower potential emissions.

(j) Equivalent emission limitation by permit

(1) Effective date

The requirements of this subsection shall apply in each State beginning on the effective date of a permit program established pursuant to subchapter V in such State, but not prior to the date 42 months after November 15, 1990.

(2) Failure to promulgate a standard

In the event that the Administrator fails to promulgate a standard for a category or subcategory of major sources by the date established pursuant to subsection (e)(1) and (3), and beginning 18 months after such date (but not prior to the effective date of a permit program under subchapter V), the owner or operator of any major source in such category or subcategory shall submit a permit application under paragraph (3) and such owner or operator shall also comply with paragraphs (5) and (6).

(3) Applications

By the date established by paragraph (2), the owner or operator of a major source subject to this subsection shall file an application for a permit. If the owner or operator of a source has submitted a timely and complete application for a permit required by this subsection, any failure to have a permit shall not be a violation of paragraph (2), unless the delay in final action is due to the failure of the applicant to timely submit information required or requested to process the application. The Administrator shall not later than 18 months after November 15, 1990, and after notice and opportunity for comment, establish requirements for applications under this subsection including a standard application form and criteria for determining in a timely manner the completeness of applications.

(4) Review and approval

Permit applications submitted under this subsection shall be reviewed and approved or disapproved according to the provisions of section 7661d of this title. In the event that the Administrator (or the State) disapproves a permit application submitted under this subsection or determines that the application is incomplete, the applicant shall have up to 6 months to revise the application to meet the objections of the Administrator (or the State).

(5) Emission limitation

The permit shall be issued pursuant to subchapter V and shall contain emission limitations for the hazardous air pollutants subject to regulation under this section and emitted by the source that the Administrator (or the State) determines, on a case-by-case basis, to be equivalent to the limitation that would apply to such source if an emission standard had been promulgated in a timely manner under subsection (d). In the alternative, if the applicable criteria are met, the permit may contain an emissions limitation established according to the provisions of subsection (i)(5). For purposes of the preceding sentence, the reduction required by subsection (i)(5)(A) shall be achieved by the date on which the relevant standard should have been promulgated under subsection (d). No such pollutant may be emitted in amounts exceeding an emission limitation contained in a permit immediately for new sources and, as expeditiously as practicable, but not later than the date 3 years after the permit is issued for existing sources or such other compliance date as would apply under subsection (i).

(6) Applicability of subsequent standards

If the Administrator promulgates an emission standard that is applicable to the major source prior to the date on which a permit application is approved, the emission limitation in the permit shall reflect the promulgated standard rather than the emission limitation determined pursuant to paragraph (5), provided that the source shall have the compliance period provided under subsection (i). If the Administrator promulgates a standard under subsection (d) that would be applicable to the source in lieu of the emission limitation established by permit under this subsection after the date on which the permit has been issued, the Administrator (or the State) shall revise such permit upon the next renewal to reflect the standard promulgated by the Administrator providing such source a reasonable time to comply, but no longer than 8 years after such standard is promulgated or 8 years after the date on which the source is first required to comply with the emissions limitation established by paragraph (5), whichever is earlier.

(k) Area source program

(1) Findings and purpose

The Congress finds that emissions of hazardous air pollutants from area sources may individually, or in the aggregate, present significant risks to public health in urban areas. Considering the large number of persons exposed and the risks of carcinogenic and other adverse health effects from hazardous air pollutants, ambient concentrations characteristic of large urban areas should be reduced to levels substantially below those currently experienced. It is the purpose of this subsection to achieve a substantial reduction in emissions of hazardous air pollutants from area sources and an equivalent reduction in the public health risks associated with such sources including a reduction of not less than 75 per centum in the incidence of cancer attributable to emissions from such sources.

(2) Research program

The Administrator shall, after consultation with State and local air pollution control officials, conduct a program of research with respect to sources of hazardous air pollutants in urban areas and shall include within such program—

(A) ambient monitoring for a broad range of hazardous air pollutants (including, but not limited to, volatile organic compounds, metals, pesticides and products of incomplete combustion) in a representative number of urban locations;

(B) analysis to characterize the sources of such pollution with a focus on area sources and the contribution that such sources make to public health risks from hazardous air pollutants; and

(C) consideration of atmospheric transformation and other factors which can elevate public health risks from such pollutants.

Health effects considered under this program shall include, but not be limited to, carcinogenicity, mutagenicity, teratogenicity, neurotoxicity, reproductive dysfunction and other acute and chronic effects including the role of such pollutants as precursors of ozone or acid aerosol formation. The Administrator shall report the preliminary results of such research not later than 3 years after November 15, 1990.

(3) National strategy

(A) Considering information collected pursuant to the monitoring program authorized by paragraph (2), the Administrator shall, not later than 5 years after November 15, 1990, and after notice and opportunity for public comment, prepare and transmit to the Congress a comprehensive strategy to control emissions of hazardous air pollutants from area sources in urban areas.

(B) The strategy shall—

(i) identify not less than 30 hazardous air pollutants which, as the result of emissions from area sources, present the greatest threat to public health in the largest number of urban areas and that are or will be listed pursuant to subsection (b), and

(ii) identify the source categories or subcategories emitting such pollutants that are or will be listed pursuant to subsection (c). When identifying categories and subcategories of sources under this subparagraph, the Administrator shall assure that sources accounting for 90 per centum or more of the aggregate emissions of each of the 30 identified hazardous air pollutants are subject to standards pursuant to subsection (d).

(C) The strategy shall include a schedule of specific actions to substantially reduce the public health risks posed by the release of hazardous air pollutants from area sources that will be implemented by the Administrator under the authority of this or other laws (including, but not limited to, the Toxic Substances Control Act [15 U.S.C. 2601 et seq.], the Federal Insecticide, Fungicide and Rodenticide Act [7 U.S.C. 136 et seq.] and the Resource Conservation and Recovery Act [42 U.S.C. 6901 et seq.]) or by the States. The strategy shall achieve a reduction in the incidence of cancer attributable to exposure to hazardous air pollutants emitted by stationary sources of not less than 75 per centum, considering control of emissions of hazardous air pollutants from all stationary sources and resulting from measures implemented by the Administrator or by the States under this or other laws.

(D) The strategy may also identify research needs in monitoring, analytical methodology, modeling or pollution control techniques and recommendations for changes in law that would further the goals and objectives of this subsection.

(E) Nothing in this subsection shall be interpreted to preclude or delay implementation of actions with respect to area sources of hazardous air pollutants under consideration pursuant to this or any other law and that may be promulgated before the strategy is prepared.

(F) The Administrator shall implement the strategy as expeditiously as practicable assuring that all sources are in compliance with all requirements not later than 9 years after November 15, 1990.

(G) As part of such strategy the Administrator shall provide for ambient monitoring and emissions modeling in urban areas as appropriate to demonstrate that the goals and objectives of the strategy are being met.

(4) Areawide activities

In addition to the national urban air toxics strategy authorized by paragraph (3), the Administrator shall also encourage and support areawide strategies developed by State or local air pollution control agencies that are intended to reduce risks from emissions by area sources within a particular urban area. From the funds available for grants under this section, the Administrator shall set aside not less than 10 per centum to support areawide strategies addressing hazardous air pollutants emitted by area sources and shall award such funds on a demonstration basis to those States with innovative and effective strategies. At the request of State or local air pollution control officials, the Administrator shall prepare guidelines for control technologies or management practices which may be applicable to various categories or subcategories of area sources.

(5) Report

The Administrator shall report to the Congress at intervals not later than 8 and 12 years after November 15, 1990, on actions taken under this subsection and other parts of this chapter to reduce the risk to public health posed by the release of hazardous air pollutants from area sources. The reports shall also identify specific metropolitan areas that continue to experience high risks to public health as the result of emissions from area sources.

(*l*) State programs

(1) In general

Each State may develop and submit to the Administrator for approval a program for the implementation and enforcement (including a review of enforcement delegations previously granted) of emission standards and other requirements for air pollutants subject to this section or requirements for the prevention and mitigation of accidental releases pursuant to subsection (r). A program submitted by a State under this subsection may provide for partial or complete delegation of the Administrator's authorities and responsibilities to implement and enforce emissions standards and prevention requirements but shall not include authority to set standards less stringent than those promulgated by the Administrator under this chapter.

(2) Guidance

Not later than 12 months after November 15, 1990, the Administrator shall publish guidance that would be useful to the States in developing programs for submittal under this subsection. The guidance shall also provide for the registration of all facilities producing, processing, handling or storing any substance listed pursuant to subsection (r) in amounts greater than the threshold quantity. The Administrator shall include as an element in such guidance an optional program begun in 1986 for the review of high-risk point sources of air pollutants including, but not limited to, hazardous air pollutants listed pursuant to subsection (b).

(3) Technical assistance

The Administrator shall establish and maintain an air toxics clearinghouse and center to provide technical information and assistance to State and local agencies and, on a cost recovery basis, to others on control technology, health and ecological risk assessment, risk analysis, ambient monitoring and modeling, and emissions measurement and monitoring. The Administrator shall use the authority of section 7403 of this title to examine methods for preventing, measuring, and controlling emissions and evaluating associated health and ecological risks. Where appropriate, such activity shall be conducted with not-for-profit organizations. The Administrator may conduct research on methods for preventing, measuring and controlling emissions and evaluating associated health and environment risks. All information collected under this paragraph shall be available to the public.

(4) Grants

Upon application of a State, the Administrator may make grants, subject to such terms and conditions as the Administrator deems appropriate, to such State for the purpose of assisting the State in developing and implementing a program for submittal and approval under this subsection. Programs assisted under this paragraph may include program elements addressing air pollutants or extremely hazardous substances other than those specifically subject to this section. Grants under this paragraph may include support for high-risk point source review as provided in paragraph (2) and support for the development and implementation of areawide area source programs pursuant to subsection (k).

(5) Approval or disapproval

Not later than 180 days after receiving a program submitted by a State, and after notice and opportunity for public comment, the Administrator shall either approve or disapprove such program. The Administrator shall disapprove any program submitted by a State, if the Administrator determines that—

(A) the authorities contained in the program are not adequate to assure compliance by all sources within the State with each applicable standard, regulation or requirement established by the Administrator under this section;

(B) adequate authority does not exist, or adequate resources are not available, to implement the program;

(C) the schedule for implementing the program and assuring compliance by affected sources is not sufficiently expeditious; or

(D) the program is otherwise not in compliance with the guidance issued by the Administrator under paragraph (2) or is not likely to satisfy, in whole or in part, the objectives of this chapter.

If the Administrator disapproves a State program, the Administrator shall notify the State of any revisions or modifications necessary to obtain approval. The State may revise and resubmit the proposed program for review and approval pursuant to the provisions of this subsection.

(6) Withdrawal

Whenever the Administrator determines, after public hearing, that a State is not administering and enforcing a program approved pursuant to this subsection in accordance with the guidance published pursuant to paragraph (2) or the requirements of paragraph (5), the Administrator shall so notify the State and, if action which will assure prompt compliance is not taken within 90 days, the Administrator shall withdraw approval of the program. The Administrator shall not withdraw approval of any program unless the State shall have been notified and the reasons for withdrawal shall have been stated in writing and made public.

(7) Authority to enforce

Nothing in this subsection shall prohibit the Administrator from enforcing any applicable emission standard or requirement under this section.

(8) Local program

The Administrator may, after notice and opportunity for public comment, approve a program developed and submitted by a local air pollution control agency (after consultation with the State) pursuant to this subsection and any such agency implementing an approved program may take any action authorized to be taken by a State under this section.

(9) Permit authority

Nothing in this subsection shall affect the authorities and obligations of the Administrator or the State under subchapter V.

(m) Atmospheric deposition to Great Lakes and coastal waters

(1) Deposition assessment

The Administrator, in cooperation with the Under Secretary of Commerce for Oceans and

Atmosphere, shall conduct a program to identify and assess the extent of atmospheric deposition of hazardous air pollutants (and in the discretion of the Administrator, other air pollutants) to the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters. As part of such program, the Administrator shall—

(A) monitor the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters, including monitoring of the Great Lakes through the monitoring network established pursuant to paragraph (2) of this subsection and designing and deploying an atmospheric monitoring network for coastal waters pursuant to paragraph (4);

(B) investigate the sources and deposition rates of atmospheric deposition of air pollutants (and their atmospheric transformation precursors);

(C) conduct research to develop and improve monitoring methods and to determine the relative contribution of atmospheric pollutants to total pollution loadings to the Great Lakes, the Chesapeake Bay, Lake Champlain, and coastal waters;

(D) evaluate any adverse effects to public health or the environment caused by such deposition (including effects resulting from indirect exposure pathways) and assess the contribution of such deposition to violations of water quality standards established pursuant to the Federal Water Pollution Control Act [33 U.S.C. 1251 et seq.] and drinking water standards established pursuant to the Safe Drinking Water Act [42 U.S.C. 300f et seq.]; and

(E) sample for such pollutants in biota, fish, and wildlife of the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters and characterize the sources of such pollutants.

(2) Great Lakes monitoring network

The Administrator shall oversee, in accordance with Annex 15 of the Great Lakes Water Quality Agreement, the establishment and operation of a Great Lakes atmospheric deposition network to monitor atmospheric deposition of hazardous air pollutants (and in the Administrator's discretion, other air pollutants) to the Great Lakes.

(A) As part of the network provided for in this paragraph, and not later than December 31, 1991, the Administrator shall establish in each of the 5 Great Lakes at least 1 facility capable of monitoring the atmospheric deposition of hazardous air pollutants in both dry and wet conditions.

(B) The Administrator shall use the data provided by the network to identify and track the movement of hazardous air pollutants through the Great Lakes, to determine the portion of water pollution loadings attributable to atmospheric deposition of such pollutants, and to support development of remedial action plans and other management plans as required by the Great Lakes Water Quality Agreement.

(C) The Administrator shall assure that the data collected by the Great Lakes atmospheric deposition monitoring network is in a format compatible with databases sponsored by the International Joint Commission, Canada, and the several States of the Great Lakes region.

(3) Monitoring for the Chesapeake Bay and Lake Champlain

The Administrator shall establish at the Chesapeake Bay and Lake Champlain atmospheric deposition stations to monitor deposition of hazardous air pollutants (and in the Administrator's discretion, other air pollutants) within the Chesapeake Bay and Lake Champlain watersheds. The Administrator shall determine the role of air deposition in the pollutant loadings of the Chesapeake Bay and Lake Champlain, investigate the sources of air pollutants deposited in the watersheds, evaluate the health and environmental effects of such pollutant loadings, and shall sample such pollutants in biota, fish and wildlife within the watersheds, as necessary to characterize such effects.

(4) Monitoring for coastal waters

The Administrator shall design and deploy atmospheric deposition monitoring networks for coastal waters and their watersheds and shall make any information collected through such networks available to the public. As part of this effort, the Administrator shall conduct research to develop and improve deposition monitoring methods, and to determine the relative contribution of atmospheric pollutants to pollutant loadings. For purposes of this subsection, "coastal waters" shall mean estuaries selected pursuant to section 320(a)(2)(A) of the Federal Water Pollution Control Act [33 U.S.C. 1330(a)(2)(A)] or listed pursuant to section 320(a)(2)(B) of such Act [33 U.S.C. 1330(a)(2)(B)] or estuarine research reserves designated pursuant to section 1461 of title 16.

(5) Report

Within 3 years of November 15, 1990, and biennially thereafter, the Administrator, in cooperation with the Under Secretary of Commerce for Oceans and Atmosphere, shall submit to the Congress a report on the results of any monitoring, studies, and investigations conducted pursuant to this subsection. Such report shall include, at a minimum, an assessment of—

(A) the contribution of atmospheric deposition to pollution loadings in the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters;

(B) the environmental and public health effects of any pollution which is attributable to atmospheric deposition to the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters;

(C) the source or sources of any pollution to the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters which is attributable to atmospheric deposition;

(D) whether pollution loadings in the Great Lakes, the Chesapeake Bay, Lake Champlain or coastal waters cause or contribute to exceedances of drinking water standards pursuant to the Safe Drinking

Water Act [42 U.S.C. 300f et seq.] or water quality standards pursuant to the Federal Water Pollution Control Act [33 U.S.C. 1251 et seq.] or, with respect to the Great Lakes, exceedances of the specific objectives of the Great Lakes Water Quality Agreement; and

(E) a description of any revisions of the requirements, standards, and limitations pursuant to this chapter and other applicable Federal laws as are necessary to assure protection of human health and the environment.

(6) Additional regulation

As part of the report to Congress, the Administrator shall determine whether the other provisions of this section are adequate to prevent serious adverse effects to public health and serious or widespread environmental effects, including such effects resulting from indirect exposure pathways, associated with atmospheric deposition to the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters of hazardous air pollutants (and their atmospheric transformation products). The Administrator shall take into consideration the tendency of such pollutants to bioaccumulate. Within 5 years after November 15, 1990, the Administrator shall, based on such report and determination, promulgate, in accordance with this section, such further emission standards or control measures as may be necessary and appropriate to prevent such effects, including effects due to bioaccumulation and indirect exposure pathways. Any requirements promulgated pursuant to this paragraph with respect to coastal waters shall only apply to the coastal waters of the States which are subject to section 7627(a) of this title.

(n) Other provisions

(1) Electric utility steam generating units

(A) The Administrator shall perform a study of the hazards to public health reasonably anticipated to occur as a result of emissions by electric utility steam generating units of pollutants listed under subsection (b) after imposition of the requirements of this chapter. The Administrator shall report the results of this study to the Congress within 3 years after November 15, 1990. The Administrator shall develop and describe in the Administrator's report to Congress alternative control strategies for emissions which may warrant regulation under this section. The Administrator shall regulate electric utility steam generating units under this section, if the Administrator finds such regulation is appropriate and necessary after considering the results of the study required by this subparagraph.

(B) The Administrator shall conduct, and transmit to the Congress not later than 4 years after November 15, 1990, a study of mercury emissions from electric utility steam generating units, municipal waste combustion units, and other sources, including area sources. Such study shall consider the rate and mass of such emissions, the health and environmental effects of such emissions, technologies which are available to control such emissions, and the costs of such technologies.

(C) The National Institute of Environmental Health Sciences shall conduct, and transmit to the Congress not later than 3 years after November 15, 1990, a study to determine the threshold level of mercury exposure below which adverse human health effects are not expected to occur. Such study shall include a threshold for mercury concentrations in the tissue of fish which may be consumed (including consumption by sensitive populations) without adverse effects to public health.

(2) Coke oven production technology study

(A) The Secretary of the Department of Energy and the Administrator shall jointly undertake a 6-year study to assess coke oven production emission control technologies and to assist in the development and commercialization of technically practicable and economically viable control technologies which have the potential to significantly reduce emissions of hazardous air pollutants from coke oven production facilities. In identifying control technologies, the Secretary and the Administrator shall consider the range of existing coke oven operations and battery design and the availability of sources of materials for such coke ovens as well as alternatives to existing coke oven production design.

(B) The Secretary and the Administrator are authorized to enter into agreements with persons who propose to develop, install and operate coke production emission control technologies which have the potential for significant emissions reductions of hazardous air pollutants provided that Federal funds shall not exceed 50 per centum of the cost of any project assisted pursuant to this paragraph.

(C) On completion of the study, the Secretary shall submit to Congress a report on the results of the study and shall make recommendations to the Administrator identifying practicable and economically viable control technologies for coke oven production facilities to reduce residual risks remaining after implementation of the standard under subsection (d).

(D) There are authorized to be appropriated $5,000,000 for each of the fiscal years 1992 through 1997 to carry out the program authorized by this paragraph.

(3) Publicly owned treatment works

The Administrator may conduct, in cooperation with the owners and operators of publicly owned treatment works, studies to characterize emissions of hazardous air pollutants emitted by such facilities, to identify industrial, commercial and residential discharges that contribute to such emissions and to demonstrate control measures for such emissions. When promulgating any standard under this section applicable to publicly owned treatment works, the Administrator may provide for control measures that include pretreatment of discharges causing emissions of hazardous air pollutants and process or product substitutions or limitations that may be effective in reducing such emissions. The Administrator may prescribe uniform sampling, modeling and risk assessment methods for use in implementing this subsection.

(4) Oil and gas wells; pipeline facilities

(A) Notwithstanding the provisions of subsection (a), emissions from any oil or gas exploration or production well (with its associated equipment) and emissions from any pipeline compressor or pump station shall not be aggregated with emissions from other similar units, whether or not such units are in a contiguous area or under common control, to determine whether such units or stations are major sources, and in the case of any oil or gas exploration or production well (with its associated equipment), such emissions shall not be aggregated for any purpose under this section.

(B) The Administrator shall not list oil and gas production wells (with its associated equipment) as an area source category under subsection (c), except that the Administrator may establish an area source category for oil and gas production wells located in any metropolitan statistical area or consolidated metropolitan statistical area with a population in excess of 1 million, if the Administrator determines that emissions of hazardous air pollutants from such wells present more than a negligible risk of adverse effects to public health.

(5) Hydrogen sulfide

The Administrator is directed to assess the hazards to public health and the environment resulting from the emission of hydrogen sulfide associated with the extraction of oil and natural gas resources. To the extent practicable, the assessment shall build upon and not duplicate work conducted for an assessment pursuant to section 8002(m) of the Solid Waste Disposal Act [42 U.S.C. 6982(m)] and shall reflect consultation with the States. The assessment shall include a review of existing State and industry control standards, techniques and enforcement. The Administrator shall report to the Congress within 24 months after November 15, 1990, with the findings of such assessment, together with any recommendations, and shall, as appropriate, develop and implement a control strategy for emissions of hydrogen sulfide to protect human health and the environment, based on the findings of such assessment, using authorities under this chapter including sections[3] 7411 of this title and this section.

(6) Hydrofluoric acid

Not later than 2 years after November 15, 1990, the Administrator shall, for those regions of the country which do not have comprehensive health and safety regulations with respect to hydrofluoric acid, complete a study of the potential hazards of hydrofluoric acid and the uses of hydrofluoric acid in industrial and commercial applications to public health and the environment considering a range of events including worst-case accidental releases and shall make recommendations to the Congress for the reduction of such hazards, if appropriate.

(7) RCRA facilities

In the case of any category or subcategory of sources the air emissions of which are regulated under subtitle C of the Solid Waste Disposal Act [42 U.S.C. 6921 et seq.], the Administrator shall take into account any regulations of such emissions which are promulgated under such subtitle and shall, to the maximum extent practicable and consistent with the provisions of this section, ensure that the requirements of such subtitle and this section are consistent.

(*o*) National Academy of Sciences study

(1) Request of the Academy

Within 3 months of November 15, 1990, the Administrator shall enter into appropriate arrangements with the National Academy of Sciences to conduct a review of—

(A) risk assessment methodology used by the Environmental Protection Agency to determine the carcinogenic risk associated with exposure to hazardous air pollutants from source categories and subcategories subject to the requirements of this section; and

(B) improvements in such methodology.

(2) Elements to be studied

In conducting such review, the National Academy of Sciences should consider, but not be limited to, the following—

(A) the techniques used for estimating and describing the carcinogenic potency to humans of hazardous air pollutants; and

(B) the techniques used for estimating exposure to hazardous air pollutants (for hypothetical and actual maximally exposed individuals as well as other exposed individuals).

(3) Other health effects of concern

To the extent practicable, the Academy shall evaluate and report on the methodology for assessing the risk of adverse human health effects other than cancer for which safe thresholds of exposure may not exist, including, but not limited to, inheritable genetic mutations, birth defects, and reproductive dysfunctions.

(4) Report

A report on the results of such review shall be submitted to the Senate Committee on Environment and Public Works, the House Committee on Energy and Commerce, the Risk Assessment and Management Commission established by section 303 of the Clean Air Act Amendments of 1990 and the Administrator not later than 30 months after November 15, 1990.

(5) Assistance

The Administrator shall assist the Academy in gathering any information the Academy deems necessary to carry out this subsection. The Administrator may use any authority under this chapter to obtain information from any person, and to require any person to conduct tests, keep and produce records, and make reports respecting research or other activities conducted by such person as necessary to carry out this subsection.

(6) Authorization

Of the funds authorized to be appropriated to the Administrator by this chapter, such

[3] So in original. Probably should be "section".

amounts as are required shall be available to carry out this subsection.

(7) Guidelines for carcinogenic risk assessment

The Administrator shall consider, but need not adopt, the recommendations contained in the report of the National Academy of Sciences prepared pursuant to this subsection and the views of the Science Advisory Board, with respect to such report. Prior to the promulgation of any standard under subsection (f), and after notice and opportunity for comment, the Administrator shall publish revised Guidelines for Carcinogenic Risk Assessment or a detailed explanation of the reasons that any recommendations contained in the report of the National Academy of Sciences will not be implemented. The publication of such revised Guidelines shall be a final Agency action for purposes of section 7607 of this title.

(p) Mickey Leland National Urban Air Toxics Research Center

(1) Establishment

The Administrator shall oversee the establishment of a National Urban Air Toxics Research Center, to be located at a university, a hospital, or other facility capable of undertaking and maintaining similar research capabilities in the areas of epidemiology, oncology, toxicology, pulmonary medicine, pathology, and biostatistics. The center shall be known as the Mickey Leland National Urban Air Toxics Research Center. The geographic site of the National Urban Air Toxics Research Center should be further directed to Harris County, Texas, in order to take full advantage of the well developed scientific community presence on-site at the Texas Medical Center as well as the extensive data previously compiled for the comprehensive monitoring system currently in place.

(2) Board of Directors

The National Urban Air Toxics Research Center shall be governed by a Board of Directors to be comprised of 9 members, the appointment of which shall be allocated pro rata among the Speaker of the House, the Majority Leader of the Senate and the President. The members of the Board of Directors shall be selected based on their respective academic and professional backgrounds and expertise in matters relating to public health, environmental pollution and industrial hygiene. The duties of the Board of Directors shall be to determine policy and research guidelines, submit views from center sponsors and the public and issue periodic reports of center findings and activities.

(3) Scientific Advisory Panel

The Board of Directors shall be advised by a Scientific Advisory Panel, the 13 members of which shall be appointed by the Board, and to include eminent members of the scientific and medical communities. The Panel membership may include scientists with relevant experience from the National Institute of Environmental Health Sciences, the Center for Disease Control, the Environmental Protection Agency, the National Cancer Institute, and others, and the Panel shall conduct peer review and evaluate research results. The Panel shall assist the Board in developing the research agenda, reviewing proposals and applications, and advise on the awarding of research grants.

(4) Funding

The center shall be established and funded with both Federal and private source funds.

(q) Savings provision

(1) Standards previously promulgated

Any standard under this section in effect before the date of enactment of the Clean Air Act Amendments of 1990 [November 15, 1990] shall remain in force and effect after such date unless modified as provided in this section before the date of enactment of such Amendments or under such Amendments. Except as provided in paragraph (4), any standard under this section which has been promulgated, but has not taken effect, before such date shall not be affected by such Amendments unless modified as provided in this section before such date or under such Amendments. Each such standard shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) within 10 years after the date of enactment of the Clean Air Act Amendments of 1990. If a timely petition for review of any such standard under section 7607 of this title is pending on such date of enactment, the standard shall be upheld if it complies with this section as in effect before that date. If any such standard is remanded to the Administrator, the Administrator may in the Administrator's discretion apply either the requirements of this section, or those of this section as in effect before the date of enactment of the Clean Air Act Amendments of 1990.

(2) Special rule

Notwithstanding paragraph (1), no standard shall be established under this section, as amended by the Clean Air Act Amendments of 1990, for radionuclide emissions from (A) elemental phosphorous plants, (B) grate calcination elemental phosphorous plants, (C) phosphogypsum stacks, or (D) any subcategory of the foregoing. This section, as in effect prior to the date of enactment of the Clean Air Act Amendments of 1990 [November 15, 1990], shall remain in effect for radionuclide emissions from such plants and stacks.

(3) Other categories

Notwithstanding paragraph (1), this section, as in effect prior to the date of enactment of the Clean Air Act Amendments of 1990 [November 15, 1990], shall remain in effect for radionuclide emissions from non-Department of Energy Federal facilities that are not licensed by the Nuclear Regulatory Commission, coal-fired utility and industrial boilers, underground uranium mines, surface uranium mines, and disposal of uranium mill tailings piles, unless the Administrator, in the Administrator's discretion, applies the requirements of this section as modified by the Clean Air Act Amendments of 1990 to such sources of radionuclides.

(4) Medical facilities

Notwithstanding paragraph (1), no standard promulgated under this section prior to November 15, 1990, with respect to medical research or treatment facilities shall take effect for two years following November 15, 1990, unless the Administrator makes a determination pursuant to a rulemaking under subsection (d)(9). If the Administrator determines that the regulatory program established by the Nuclear Regulatory Commission for such facilities does not provide an ample margin of safety to protect public health, the requirements of this section shall fully apply to such facilities. If the Administrator determines that such regulatory program does provide an ample margin of safety to protect the public health, the Administrator is not required to promulgate a standard under this section for such facilities, as provided in subsection (d)(9).

(r) Prevention of accidental releases

(1) Purpose and general duty

It shall be the objective of the regulations and programs authorized under this subsection to prevent the accidental release and to minimize the consequences of any such release of any substance listed pursuant to paragraph (3) or any other extremely hazardous substance. The owners and operators of stationary sources producing, processing, handling or storing such substances have a general duty in the same manner and to the same extent as section 654 of title 29 to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur. For purposes of this paragraph, the provisions of section 7604 of this title shall not be available to any person or otherwise be construed to be applicable to this paragraph. Nothing in this section shall be interpreted, construed, implied or applied to create any liability or basis for suit for compensation for bodily injury or any other injury or property damages to any person which may result from accidental releases of such substances.

(2) Definitions

(A) The term ''accidental release'' means an unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source.

(B) The term ''regulated substance'' means a substance listed under paragraph (3).

(C) The term ''stationary source'' means any buildings, structures, equipment, installations or substance emitting stationary activities (i) which belong to the same industrial group, (ii) which are located on one or more contiguous properties, (iii) which are under the control of the same person (or persons under common control), and (iv) from which an accidental release may occur.

(D) The term ''retail facility'' means a stationary source at which more than one-half of the income is obtained from direct sales to end users or at which more than one-half of the fuel sold, by volume, is sold through a cylinder exchange program.

(3) List of substances

The Administrator shall promulgate not later than 24 months after November 15, 1990, an initial list of 100 substances which, in the case of an accidental release, are known to cause or may reasonably be anticipated to cause death, injury, or serious adverse effects to human health or the environment. For purposes of promulgating such list, the Administrator shall use, but is not limited to, the list of extremely hazardous substances published under the Emergency Planning and Community Right-to-Know[4] Act of 1986 [42 U.S.C. 11001 et seq.], with such modifications as the Administrator deems appropriate. The initial list shall include chlorine, anhydrous ammonia, methyl chloride, ethylene oxide, vinyl chloride, methyl isocyanate, hydrogen cyanide, ammonia, hydrogen sulfide, toluene diisocyanate, phosgene, bromine, anhydrous hydrogen chloride, hydrogen fluoride, anhydrous sulfur dioxide, and sulfur trioxide. The initial list shall include at least 100 substances which pose the greatest risk of causing death, injury, or serious adverse effects to human health or the environment from accidental releases. Regulations establishing the list shall include an explanation of the basis for establishing the list. The list may be revised from time to time by the Administrator on the Administrator's own motion or by petition and shall be reviewed at least every 5 years. No air pollutant for which a national primary ambient air quality standard has been established shall be included on any such list. No substance, practice, process, or activity regulated under subchapter VI shall be subject to regulations under this subsection. The Administrator shall establish procedures for the addition and deletion of substances from the list established under this paragraph consistent with those applicable to the list in subsection (b).

(4) Factors to be considered

In listing substances under paragraph (3), the Administrator—

(A) shall consider—

(i) the severity of any acute adverse health effects associated with accidental releases of the substance;

(ii) the likelihood of accidental releases of the substance; and

(iii) the potential magnitude of human exposure to accidental releases of the substance; and

(B) shall not list a flammable substance when used as a fuel or held for sale as a fuel at a retail facility under this subsection solely because of the explosive or flammable properties of the substance, unless a fire or explosion caused by the substance will result in acute adverse health effects from human exposure to the substance, including the unburned fuel or its combustion byproducts, other than those caused by the heat of the fire or impact of the explosion.

[4] So in original. Probably should be ''Right-To-Know''.

(5) Threshold quantity

At the time any substance is listed pursuant to paragraph (3), the Administrator shall establish by rule, a threshold quantity for the substance, taking into account the toxicity, reactivity, volatility, dispersibility, combustibility, or flammability of the substance and the amount of the substance which, as a result of an accidental release, is known to cause or may reasonably be anticipated to cause death, injury or serious adverse effects to human health for which the substance was listed. The Administrator is authorized to establish a greater threshold quantity for, or to exempt entirely, any substance that is a nutrient used in agriculture when held by a farmer.

(6) Chemical Safety Board

(A) There is hereby established an independent safety board to be known as the Chemical Safety and Hazard Investigation Board.

(B) The Board shall consist of 5 members, including a Chairperson, who shall be appointed by the President, by and with the advice and consent of the Senate. Members of the Board shall be appointed on the basis of technical qualification, professional standing, and demonstrated knowledge in the fields of accident reconstruction, safety engineering, human factors, toxicology, or air pollution regulation. The terms of office of members of the Board shall be 5 years. Any member of the Board, including the Chairperson, may be removed for inefficiency, neglect of duty, or malfeasance in office. The Chairperson shall be the Chief Executive Officer of the Board and shall exercise the executive and administrative functions of the Board.

(C) The Board shall—

(i) investigate (or cause to be investigated), determine and report to the public in writing the facts, conditions, and circumstances and the cause or probable cause of any accidental release resulting in a fatality, serious injury or substantial property damages;

(ii) issue periodic reports to the Congress, Federal, State and local agencies, including the Environmental Protection Agency and the Occupational Safety and Health Administration, concerned with the safety of chemical production, processing, handling and storage, and other interested persons recommending measures to reduce the likelihood or the consequences of accidental releases and proposing corrective steps to make chemical production, processing, handling and storage as safe and free from risk of injury as is possible and may include in such reports proposed rules or orders which should be issued by the Administrator under the authority of this section or the Secretary of Labor under the Occupational Safety and Health Act [29 U.S.C. 651 et seq.] to prevent or minimize the consequences of any release of substances that may cause death, injury or other serious adverse effects on human health or substantial property damage as the result of an accidental release; and

(iii) establish by regulation requirements binding on persons for reporting accidental releases into the ambient air subject to the Board's investigatory jurisdiction. Reporting releases to the National Response Center, in lieu of the Board directly, shall satisfy such regulations. The National Response Center shall promptly notify the Board of any releases which are within the Board's jurisdiction.

(D) The Board may utilize the expertise and experience of other agencies.

(E) The Board shall coordinate its activities with investigations and studies conducted by other agencies of the United States having a responsibility to protect public health and safety. The Board shall enter into a memorandum of understanding with the National Transportation Safety Board to assure coordination of functions and to limit duplication of activities which shall designate the National Transportation Safety Board as the lead agency for the investigation of releases which are transportation related. The Board shall not be authorized to investigate marine oil spills, which the National Transportation Safety Board is authorized to investigate. The Board shall enter into a memorandum of understanding with the Occupational Safety and Health Administration so as to limit duplication of activities. In no event shall the Board forego an investigation where an accidental release causes a fatality or serious injury among the general public, or had the potential to cause substantial property damage or a number of deaths or injuries among the general public.

(F) The Board is authorized to conduct research and studies with respect to the potential for accidental releases, whether or not an accidental release has occurred, where there is evidence which indicates the presence of a potential hazard or hazards. To the extent practicable, the Board shall conduct such studies in cooperation with other Federal agencies having emergency response authorities, State and local governmental agencies and associations and organizations from the industrial, commercial, and nonprofit sectors.

(G) No part of the conclusions, findings, or recommendations of the Board relating to any accidental release or the investigation thereof shall be admitted as evidence or used in any action or suit for damages arising out of any matter mentioned in such report.

(H) Not later than 18 months after November 15, 1990, the Board shall publish a report accompanied by recommendations to the Administrator on the use of hazard assessments in preventing the occurrence and minimizing the consequences of accidental releases of extremely hazardous substances. The recommendations shall include a list of extremely hazardous substances which are not regulated substances (including threshold quantities for such substances) and categories of stationary sources for which hazard assessments would be an appropriate measure to aid in the prevention of accidental releases and to minimize the consequences of those releases that do occur. The recommendations shall also include a description of the information and analysis which would be appropriate to include in any hazard assessment. The Board shall also make recommendations with respect to the role of risk management plans as required by paragraph (8)(B)[5] in preventing accidental releases. The Board may from time to time review and revise its recommendations under this subparagraph.

(I) Whenever the Board submits a recommendation with respect to accidental releases to the Administrator, the Administrator shall respond to such recommendation formally and in writing not later than 180 days after receipt thereof. The response to the Board's recommendation by the Administrator shall indicate whether the Administrator will—

(i) initiate a rulemaking or issue such orders as are necessary to implement the recommendation in full or in part, pursuant to any timetable contained in the recommendation;[6]

(ii) decline to initiate a rulemaking or issue orders as recommended.

Any determination by the Administrator not to implement a recommendation of the Board or to implement a recommendation only in part, including any variation from the schedule contained in the recommendation, shall be accompanied by a statement from the Administrator setting forth the reasons for such determination.

(J) The Board may make recommendations with respect to accidental releases to the Secretary of Labor. Whenever the Board submits such recommendation, the Secretary shall respond to such recommendation formally and in writing not later than 180 days after receipt thereof. The response to the Board's recommendation by the Administrator[7] shall indicate whether the Secretary will—

(i) initiate a rulemaking or issue such orders as are necessary to implement the recommendation in full or in part, pursuant to any timetable contained in the recommendation;[6]

(ii) decline to initiate a rulemaking or issue orders as recommended.

Any determination by the Secretary not to implement a recommendation or to implement a recommendation only in part, including any variation from the schedule contained in the recommendation, shall be accompanied by a statement from the Secretary setting forth the reasons for such determination.

(K) Within 2 years after November 15, 1990, the Board shall issue a report to the Administrator of the Environmental Protection Agency and to the Administrator of the Occupational Safety and Health Administration recommending the adoption of regulations for the preparation of risk management plans and general requirements for the prevention of accidental releases of regulated substances into the ambient air (including recommendations for listing substances under paragraph (3)) and for the mitigation of the potential adverse effect on human health or the environment as a result of accidental releases which should be applicable to any stationary source handling any regulated substance in more than threshold amounts. The Board may include proposed rules or orders which should be issued by the Administrator under authority of this subsection or by the Secretary of Labor under the Occupational Safety and Health Act [29 U.S.C. 651 et seq.]. Any such recommendations shall be specific and shall identify the regulated substance or class of regulated substances (or other substances) to which the recommendations apply. The Administrator shall consider such recommendations before promulgating regulations required by paragraph (7)(B).

(L) The Board, or upon authority of the Board, any member thereof, any administrative law judge employed by or assigned to the Board, or any officer or employee duly designated by the Board, may for the purpose of carrying out duties authorized by subparagraph (C)—

(i) hold such hearings, sit and act at such times and places, administer such oaths, and require by subpoena or otherwise attendance and testimony of such witnesses and the production of evidence and may require by order that any person engaged in the production, processing, handling, or storage of extremely hazardous substances submit written reports and responses to requests and questions within such time and in such form as the Board may require; and

(ii) upon presenting appropriate credentials and a written notice of inspection authority, enter any property where an accidental release causing a fatality, serious injury or substantial property damage has occurred and do all things therein necessary for a proper investigation pursuant to subparagraph (C) and inspect at reasonable times records, files, papers, processes, controls, and facilities and take such samples as are relevant to such investigation.

Whenever the Administrator or the Board conducts an inspection of a facility pursuant to this subsection, employees and their representatives shall have the same rights to participate in such inspections as provided in the Occupational Safety and Health Act [29 U.S.C. 651 et seq.].

(M) In addition to that described in subparagraph (L), the Board may use any information gathering authority of the Administrator under this chapter, including the subpoena power provided in section 7607(a)(1) of this title.

(N) The Board is authorized to establish such procedural and administrative rules as are necessary to the exercise of its functions and duties. The Board is authorized without regard to section 6101 of title 41 to enter into contracts, leases, cooperative agreements or other transactions as may be necessary in the conduct of the duties and functions of the Board with any other agency, institution, or person.

(O) After the effective date of any reporting requirement promulgated pursuant to sub-

[5] So in original. Probably should be paragraph "(7)(B)".
[6] So in original. The word "or" probably should appear.
[7] So in original. The word "Administrator" probably should be "Secretary".

paragraph (C)(iii) it shall be unlawful for any person to fail to report any release of any extremely hazardous substance as required by such subparagraph. The Administrator is authorized to enforce any regulation or requirements established by the Board pursuant to subparagraph (C)(iii) using the authorities of sections 7413 and 7414 of this title. Any request for information from the owner or operator of a stationary source made by the Board or by the Administrator under this section shall be treated, for purposes of sections 7413, 7414, 7416, 7420, 7603, 7604 and 7607 of this title and any other enforcement provisions of this chapter, as a request made by the Administrator under section 7414 of this title and may be enforced by the Chairperson of the Board or by the Administrator as provided in such section.

(P) The Administrator shall provide to the Board such support and facilities as may be necessary for operation of the Board.

(Q) Consistent with subsection[8] (G) and section 7414(c) of this title any records, reports or information obtained by the Board shall be available to the Administrator, the Secretary of Labor, the Congress and the public, except that upon a showing satisfactory to the Board by any person that records, reports, or information, or particular part thereof (other than release or emissions data) to which the Board has access, if made public, is likely to cause substantial harm to the person's competitive position, the Board shall consider such record, report, or information or particular portion thereof confidential in accordance with section 1905 of title 18, except that such record, report, or information may be disclosed to other officers, employees, and authorized representatives of the United States concerned with carrying out this chapter or when relevant under any proceeding under this chapter. This subparagraph does not constitute authority to withhold records, reports, or information from the Congress.

(R) Whenever the Board submits or transmits any budget estimate, budget request, supplemental budget request, or other budget information, legislative recommendation, prepared testimony for congressional hearings, recommendation or study to the President, the Secretary of Labor, the Administrator, or the Director of the Office of Management and Budget, it shall concurrently transmit a copy thereof to the Congress. No report of the Board shall be subject to review by the Administrator or any Federal agency or to judicial review in any court. No officer or agency of the United States shall have authority to require the Board to submit its budget requests or estimates, legislative recommendations, prepared testimony, comments, recommendations or reports to any officer or agency of the United States for approval or review prior to the submission of such recommendations, testimony, comments or reports to the Congress. In the performance of their functions as established by this chapter, the members, officers and employees of the Board shall not be responsible to or subject to supervision or direction, in carrying out any duties under this subsection, of any officer or employee or agent of the Environmental Protection Agency, the Department of Labor or any other agency of the United States except that the President may remove any member, officer or employee of the Board for inefficiency, neglect of duty or malfeasance in office. Nothing in this section shall affect the application of title 5 to officers or employees of the Board.

(S) The Board shall submit an annual report to the President and to the Congress which shall include, but not be limited to, information on accidental releases which have been investigated by or reported to the Board during the previous year, recommendations for legislative or administrative action which the Board has made, the actions which have been taken by the Administrator or the Secretary of Labor or the heads of other agencies to implement such recommendations, an identification of priorities for study and investigation in the succeeding year, progress in the development of risk-reduction technologies and the response to and implementation of significant research findings on chemical safety in the public and private sector.

(7) Accident prevention

(A) In order to prevent accidental releases of regulated substances, the Administrator is authorized to promulgate release prevention, detection, and correction requirements which may include monitoring, record-keeping, reporting, training, vapor recovery, secondary containment, and other design, equipment, work practice, and operational requirements. Regulations promulgated under this paragraph may make distinctions between various types, classes, and kinds of facilities, devices and systems taking into consideration factors including, but not limited to, the size, location, process, process controls, quantity of substances handled, potency of substances, and response capabilities present at any stationary source. Regulations promulgated pursuant to this subparagraph shall have an effective date, as determined by the Administrator, assuring compliance as expeditiously as practicable.

(B)(i) Within 3 years after November 15, 1990, the Administrator shall promulgate reasonable regulations and appropriate guidance to provide, to the greatest extent practicable, for the prevention and detection of accidental releases of regulated substances and for response to such releases by the owners or operators of the sources of such releases. The Administrator shall utilize the expertise of the Secretaries of Transportation and Labor in promulgating such regulations. As appropriate, such regulations shall cover the use, operation, repair, replacement, and maintenance of equipment to monitor, detect, inspect, and control such releases, including training of persons in the use and maintenance of such equipment and in the conduct of periodic inspections. The regulations shall include procedures and measures for emergency response after an accidental release of a regulated substance in order to protect human health and the envi-

[8] So in original. Probably should be "subparagraph".

ronment. The regulations shall cover storage, as well as operations. The regulations shall, as appropriate, recognize differences in size, operations, processes, class and categories of sources and the voluntary actions of such sources to prevent such releases and respond to such releases. The regulations shall be applicable to a stationary source 3 years after the date of promulgation, or 3 years after the date on which a regulated substance present at the source in more than threshold amounts is first listed under paragraph (3), whichever is later.

(ii) The regulations under this subparagraph shall require the owner or operator of stationary sources at which a regulated substance is present in more than a threshold quantity to prepare and implement a risk management plan to detect and prevent or minimize accidental releases of such substances from the stationary source, and to provide a prompt emergency response to any such releases in order to protect human health and the environment. Such plan shall provide for compliance with the requirements of this subsection and shall also include each of the following:

(I) a hazard assessment to assess the potential effects of an accidental release of any regulated substance. This assessment shall include an estimate of potential release quantities and a determination of downwind effects, including potential exposures to affected populations. Such assessment shall include a previous release history of the past 5 years, including the size, concentration, and duration of releases, and shall include an evaluation of worst case accidental releases;

(II) a program for preventing accidental releases of regulated substances, including safety precautions and maintenance, monitoring and employee training measures to be used at the source; and

(III) a response program providing for specific actions to be taken in response to an accidental release of a regulated substance so as to protect human health and the environment, including procedures for informing the public and local agencies responsible for responding to accidental releases, emergency health care, and employee training measures.

At the time regulations are promulgated under this subparagraph, the Administrator shall promulgate guidelines to assist stationary sources in the preparation of risk management plans. The guidelines shall, to the extent practicable, include model risk management plans.

(iii) The owner or operator of each stationary source covered by clause (ii) shall register a risk management plan prepared under this subparagraph with the Administrator before the effective date of regulations under clause (i) in such form and manner as the Administrator shall, by rule, require. Plans prepared pursuant to this subparagraph shall also be submitted to the Chemical Safety and Hazard Investigation Board, to the State in which the stationary source is located, and to any local agency or entity having responsibility for planning for or responding to accidental releases which may occur at such source, and shall be available to the public under section 7414(c) of this title. The Administrator shall establish, by rule, an auditing system to regularly review and, if necessary, require revision in risk management plans to assure that the plans comply with this subparagraph. Each such plan shall be updated periodically as required by the Administrator, by rule.

(C) Any regulations promulgated pursuant to this subsection shall to the maximum extent practicable, consistent with this subsection, be consistent with the recommendations and standards established by the American Society of Mechanical Engineers (ASME), the American National Standards Institute (ANSI) or the American Society of Testing Materials (ASTM). The Administrator shall take into consideration the concerns of small business in promulgating regulations under this subsection.

(D) In carrying out the authority of this paragraph, the Administrator shall consult with the Secretary of Labor and the Secretary of Transportation and shall coordinate any requirements under this paragraph with any requirements established for comparable purposes by the Occupational Safety and Health Administration or the Department of Transportation. Nothing in this subsection shall be interpreted, construed or applied to impose requirements affecting, or to grant the Administrator, the Chemical Safety and Hazard Investigation Board, or any other agency any authority to regulate (including requirements for hazard assessment), the accidental release of radionuclides arising from the construction and operation of facilities licensed by the Nuclear Regulatory Commission.

(E) After the effective date of any regulation or requirement imposed under this subsection, it shall be unlawful for any person to operate any stationary source subject to such regulation or requirement in violation of such regulation or requirement. Each regulation or requirement under this subsection shall for purposes of sections 7413, 7414, 7416, 7420, 7604, and 7607 of this title and other enforcement provisions of this chapter, be treated as a standard in effect under subsection (d).

(F) Notwithstanding the provisions of subchapter V or this section, no stationary source shall be required to apply for, or operate pursuant to, a permit issued under such subchapter solely because such source is subject to regulations or requirements under this subsection.

(G) In exercising any authority under this subsection, the Administrator shall not, for purposes of section 653(b)(1) of title 29, be deemed to be exercising statutory authority to prescribe or enforce standards or regulations affecting occupational safety and health.

(H) PUBLIC ACCESS TO OFF-SITE CONSEQUENCE ANALYSIS INFORMATION.—

(i) DEFINITIONS.—In this subparagraph:

(I) COVERED PERSON.—The term ''covered person'' means—

(aa) an officer or employee of the United States;

(bb) an officer or employee of an agent or contractor of the Federal Government;

(cc) an officer or employee of a State or local government;

(dd) an officer or employee of an agent or contractor of a State or local government;

(ee) an individual affiliated with an entity that has been given, by a State or local government, responsibility for preventing, planning for, or responding to accidental releases;

(ff) an officer or employee or an agent or contractor of an entity described in item (ee); and

(gg) a qualified researcher under clause (vii).

(II) OFFICIAL USE.—The term ''official use'' means an action of a Federal, State, or local government agency or an entity referred to in subclause (I)(ee) intended to carry out a function relevant to preventing, planning for, or responding to accidental releases.

(III) OFF-SITE CONSEQUENCE ANALYSIS INFORMATION.—The term ''off-site consequence analysis information'' means those portions of a risk management plan, excluding the executive summary of the plan, consisting of an evaluation of 1 or more worst-case release scenarios or alternative release scenarios, and any electronic data base created by the Administrator from those portions.

(IV) RISK MANAGEMENT PLAN.—The term ''risk management plan'' means a risk management plan submitted to the Administrator by an owner or operator of a stationary source under subparagraph (B)(iii).

(ii) REGULATIONS.—Not later than 1 year after August 5, 1999, the President shall—

(I) assess—

(aa) the increased risk of terrorist and other criminal activity associated with the posting of off-site consequence analysis information on the Internet; and

(bb) the incentives created by public disclosure of off-site consequence analysis information for reduction in the risk of accidental releases; and

(II) based on the assessment under subclause (I), promulgate regulations governing the distribution of off-site consequence analysis information in a manner that, in the opinion of the President, minimizes the likelihood of accidental releases and the risk described in subclause (I)(aa) and the likelihood of harm to public health and welfare, and—

(aa) allows access by any member of the public to paper copies of off-site consequence analysis information for a limited number of stationary sources located anywhere in the United States, without any geographical restriction;

(bb) allows other public access to off-site consequence analysis information as appropriate;

(cc) allows access for official use by a covered person described in any of items (cc) through (ff) of clause (i)(I) (referred to in this subclause as a ''State or local covered person'') to off-site consequence analysis information relating to stationary sources located in the person's State;

(dd) allows a State or local covered person to provide, for official use, off-site consequence analysis information relating to stationary sources located in the person's State to a State or local covered person in a contiguous State; and

(ee) allows a State or local covered person to obtain for official use, by request to the Administrator, off-site consequence analysis information that is not available to the person under item (cc).

(iii) AVAILABILITY UNDER FREEDOM OF INFORMATION ACT.—

(I) FIRST YEAR.—Off-site consequence analysis information, and any ranking of stationary sources derived from the information, shall not be made available under section 552 of title 5 during the 1-year period beginning on August 5, 1999.

(II) AFTER FIRST YEAR.—If the regulations under clause (ii) are promulgated on or before the end of the period described in subclause (I), off-site consequence analysis information covered by the regulations, and any ranking of stationary sources derived from the information, shall not be made available under section 552 of title 5 after the end of that period.

(III) APPLICABILITY.—Subclauses (I) and (II) apply to off-site consequence analysis information submitted to the Administrator before, on, or after August 5, 1999.

(iv) AVAILABILITY OF INFORMATION DURING TRANSITION PERIOD.—The Administrator shall make off-site consequence analysis information available to covered persons for official use in a manner that meets the requirements of items (cc) through (ee) of clause (ii)(II), and to the public in a form that does not make available any information concerning the identity or location of stationary sources, during the period—

(I) beginning on August 5, 1999; and

(II) ending on the earlier of the date of promulgation of the regulations under clause (ii) or the date that is 1 year after August 5, 1999.

(v) PROHIBITION ON UNAUTHORIZED DISCLOSURE OF INFORMATION BY COVERED PERSONS.—

(I) IN GENERAL.—Beginning on August 5, 1999, a covered person shall not disclose to the public off-site consequence analysis information in any form, or any statewide or national ranking of identified stationary sources derived from such information, except as authorized by this subparagraph (including the regulations promulgated under clause (ii)). After the end of the 1-year period beginning on August 5, 1999, if regulations have not been promulgated under clause (ii), the preceding sentence shall not apply.

(II) CRIMINAL PENALTIES.—Notwithstanding section 7413 of this title, a covered person that willfully violates a restriction or prohibition established by this subparagraph (including the regulations promulgated under clause (ii)) shall, upon conviction, be fined for an infraction under section 3571 of title 18 (but shall not be subject to imprisonment) for each unauthorized disclosure of off-site consequence analysis information, except that subsection (d) of such section 3571 shall not apply to a case in which the offense results in pecuniary loss unless the defendant knew that such loss would occur. The disclosure of off-site consequence analysis information for each specific stationary source shall be considered a separate offense. The total of all penalties that may be imposed on a single person or organization under this item shall not exceed $1,000,000 for violations committed during any 1 calendar year.

(III) APPLICABILITY.—If the owner or operator of a stationary source makes off-site consequence analysis information relating to that stationary source available to the public without restriction—

(aa) subclauses (I) and (II) shall not apply with respect to the information; and

(bb) the owner or operator shall notify the Administrator of the public availability of the information.

(IV) LIST.—The Administrator shall maintain and make publicly available a list of all stationary sources that have provided notification under subclause (III)(bb).

(vi) NOTICE.—The Administrator shall provide notice of the definition of official use as provided in clause (i)(III)[9] and examples of actions that would and would not meet that definition, and notice of the restrictions on further dissemination and the penalties established by this chapter to each covered person who receives off-site consequence analysis information under clause (iv) and each covered person who receives off-site consequence analysis information for an official use under the regulations promulgated under clause (ii).

(vii) QUALIFIED RESEARCHERS.—

(I) IN GENERAL.—Not later than 180 days after August 5, 1999, the Administrator, in consultation with the Attorney General, shall develop and implement a system for providing off-site consequence analysis information, including facility identification, to any qualified researcher, including a qualified researcher from industry or any public interest group.

(II) LIMITATION ON DISSEMINATION.—The system shall not allow the researcher to disseminate, or make available on the Internet, the off-site consequence analysis information, or any portion of the off-site consequence analysis information, received under this clause.

(viii) READ-ONLY INFORMATION TECHNOLOGY SYSTEM.—In consultation with the Attorney General and the heads of other appropriate Federal agencies, the Administrator shall establish an information technology system that provides for the availability to the public of off-site consequence analysis information by means of a central data base under the control of the Federal Government that contains information that users may read, but that provides no means by which an electronic or mechanical copy of the information may be made.

(ix) VOLUNTARY INDUSTRY ACCIDENT PREVENTION STANDARDS.—The Environmental Protection Agency, the Department of Justice, and other appropriate agencies may provide technical assistance to owners and operators of stationary sources and participate in the development of voluntary industry standards that will help achieve the objectives set forth in paragraph (1).

(x) EFFECT ON STATE OR LOCAL LAW.—

(I) IN GENERAL.—Subject to subclause (II), this subparagraph (including the regulations promulgated under this subparagraph) shall supersede any provision of State or local law that is inconsistent with this subparagraph (including the regulations).

(II) AVAILABILITY OF INFORMATION UNDER STATE LAW.—Nothing in this subparagraph precludes a State from making available data on the off-site consequences of chemical releases collected in accordance with State law.

(xi) REPORT.—

(I) IN GENERAL.—Not later than 3 years after August 5, 1999, the Attorney General, in consultation with appropriate State, local, and Federal Government agencies, affected industry, and the public, shall submit to Congress a report that describes the extent to which regulations promulgated under this paragraph have resulted in actions, including the design and maintenance of safe facilities, that are effective in detecting, preventing, and minimizing the consequences of releases of regulated substances that may be caused by criminal activity. As part of this report, the Attorney General, using available data to the extent possible, and a sampling of covered stationary sources selected at the discretion of the Attorney General, and in consultation with appropriate State, local, and Federal governmental agencies, affected industry, and the public, shall review the vulnerability of covered stationary sources to criminal and terrorist activity, current industry practices regarding site security, and security of transportation of regulated substances. The Attorney General shall submit this report, containing the results of the review, together with recommendations, if any, for reducing vulnerability of covered sta-

[9] So in original. Probably should be "(i)(II)".

tionary sources to criminal and terrorist activity, to the Committee on Commerce of the United States House of Representatives and the Committee on Environment and Public Works of the United States Senate and other relevant committees of Congress.

(II) INTERIM REPORT.—Not later than 12 months after August 5, 1999, the Attorney General shall submit to the Committee on Commerce of the United States House of Representatives and the Committee on Environment and Public Works of the United States Senate, and other relevant committees of Congress, an interim report that includes, at a minimum—

(aa) the preliminary findings under subclause (I);

(bb) the methods used to develop the findings; and

(cc) an explanation of the activities expected to occur that could cause the findings of the report under subclause (I) to be different than the preliminary findings.

(III) AVAILABILITY OF INFORMATION.—Information that is developed by the Attorney General or requested by the Attorney General and received from a covered stationary source for the purpose of conducting the review under subclauses (I) and (II) shall be exempt from disclosure under section 552 of title 5 if such information would pose a threat to national security.

(xii) SCOPE.—This subparagraph—

(I) applies only to covered persons; and

(II) does not restrict the dissemination of off-site consequence analysis information by any covered person in any manner or form except in the form of a risk management plan or an electronic data base created by the Administrator from off-site consequence analysis information.

(xiii) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Administrator and the Attorney General such sums as are necessary to carry out this subparagraph (including the regulations promulgated under clause (ii)), to remain available until expended.

(8) Research on hazard assessments

The Administrator may collect and publish information on accident scenarios and consequences covering a range of possible events for substances listed under paragraph (3). The Administrator shall establish a program of long-term research to develop and disseminate information on methods and techniques for hazard assessment which may be useful in improving and validating the procedures employed in the preparation of hazard assessments under this subsection.

(9) Order authority

(A) In addition to any other action taken, when the Administrator determines that there may be an imminent and substantial endangerment to the human health or welfare or the environment because of an actual or threatened accidental release of a regulated substance, the Administrator may secure such relief as may be necessary to abate such danger or threat, and the district court of the United States in the district in which the threat occurs shall have jurisdiction to grant such relief as the public interest and the equities of the case may require. The Administrator may also, after notice to the State in which the stationary source is located, take other action under this paragraph including, but not limited to, issuing such orders as may be necessary to protect human health. The Administrator shall take action under section 7603 of this title rather than this paragraph whenever the authority of such section is adequate to protect human health and the environment.

(B) Orders issued pursuant to this paragraph may be enforced in an action brought in the appropriate United States district court as if the order were issued under section 7603 of this title.

(C) Within 180 days after November 15, 1990, the Administrator shall publish guidance for using the order authorities established by this paragraph. Such guidance shall provide for the coordinated use of the authorities of this paragraph with other emergency powers authorized by section 9606 of this title, sections 311(c), 308, 309 and 504(a) of the Federal Water Pollution Control Act [33 U.S.C. 1321(c), 1318, 1319, 1364(a)], sections 3007, 3008, 3013, and 7003 of the Solid Waste Disposal Act [42 U.S.C. 6927, 6928, 6934, 6973], sections 1445 and 1431 of the Safe Drinking Water Act [42 U.S.C. 300j–4, 300i], sections 5 and 7 of the Toxic Substances Control Act [15 U.S.C. 2604, 2606], and sections 7413, 7414, and 7603 of this title.

(10) Presidential review

The President shall conduct a review of release prevention, mitigation and response authorities of the various Federal agencies and shall clarify and coordinate agency responsibilities to assure the most effective and efficient implementation of such authorities and to identify any deficiencies in authority or resources which may exist. The President may utilize the resources and solicit the recommendations of the Chemical Safety and Hazard Investigation Board in conducting such review. At the conclusion of such review, but not later than 24 months after November 15, 1990, the President shall transmit a message to the Congress on the release prevention, mitigation and response activities of the Federal Government making such recommendations for change in law as the President may deem appropriate. Nothing in this paragraph shall be interpreted, construed or applied to authorize the President to modify or reassign release prevention, mitigation or response authorities otherwise established by law.

(11) State authority

Nothing in this subsection shall preclude, deny or limit any right of a State or political subdivision thereof to adopt or enforce any regulation, requirement, limitation or standard (including any procedural requirement) that is more stringent than a regulation, requirement, limitation or standard in effect under this subsection or that applies to a substance not subject to this subsection.

(s) Periodic report

Not later than January 15, 1993 and every 3 years thereafter, the Administrator shall prepare and transmit to the Congress a comprehensive report on the measures taken by the Agency and by the States to implement the provisions of this section. The Administrator shall maintain a database on pollutants and sources subject to the provisions of this section and shall include aggregate information from the database in each annual report. The report shall include, but not be limited to—

(1) a status report on standard-setting under subsections (d) and (f);

(2) information with respect to compliance with such standards including the costs of compliance experienced by sources in various categories and subcategories;

(3) development and implementation of the national urban air toxics program; and

(4) recommendations of the Chemical Safety and Hazard Investigation Board with respect to the prevention and mitigation of accidental releases.

(July 14, 1955, ch. 360, title I, § 112, as added Pub. L. 91–604, § 4(a), Dec. 31, 1970, 84 Stat. 1685; amended Pub. L. 95–95, title I, §§ 109(d)(2), 110, title IV, § 401(c), Aug. 7, 1977, 91 Stat. 701, 703, 791; Pub. L. 95–623, § 13(b), Nov. 9, 1978, 92 Stat. 3458; Pub. L. 101–549, title III, § 301, Nov. 15, 1990, 104 Stat. 2531; Pub. L. 102–187, Dec. 4, 1991, 105 Stat. 1285; Pub. L. 105–362, title IV, § 402(b), Nov. 10, 1998, 112 Stat. 3283; Pub. L. 106–40, §§ 2, 3(a), Aug. 5, 1999, 113 Stat. 207, 208.)

Editorial Notes

References in Text

The date of enactment, referred to in subsec. (a)(11), probably means the date of enactment of Pub. L. 101–549, which amended this section generally and was approved Nov. 15, 1990.

The Atomic Energy Act, referred to in subsec. (d)(9), probably means the Atomic Energy Act of 1954, act Aug. 1, 1946, ch. 724, as added by act Aug. 30, 1954, ch. 1073, § 1, 68 Stat. 919, which is classified principally to chapter 23 (§ 2011 et seq.) of this title. For complete classification of this Act to the Code, see Short Title note set out under section 2011 of this title and Tables.

The Federal Water Pollution Control Act, referred to in subsecs. (e)(5) and (m)(1)(D), (5)(D), is act June 30, 1948, ch. 758, as amended generally by Pub. L. 92–500, § 2, Oct. 18, 1972, 86 Stat. 816, which is classified generally to chapter 26 (§ 1251 et seq.) of Title 33, Navigation and Navigable Waters. Title II of the Act is classified generally to subchapter II (§ 1281 et seq.) of chapter 26 of Title 33. For complete classification of this Act to the Code, see Short Title note set out under section 1251 of Title 33 and Tables.

The Toxic Substances Control Act, referred to in subsec. (k)(3)(C), is Pub. L. 94–469, Oct. 11, 1976, 90 Stat. 2003, which is classified generally to chapter 53 (§ 2601 et seq.) of Title 15, Commerce and Trade. For complete classification of this Act to the Code, see Short Title note set out under section 2601 of Title 15 and Tables.

The Federal Insecticide, Fungicide and Rodenticide Act, referred to in subsec. (k)(3)(C), probably means the Federal Insecticide, Fungicide, and Rodenticide Act, act June 25, 1947, ch. 125, as amended generally by Pub. L. 92–516, Oct. 21, 1972, 86 Stat. 973, which is classified generally to subchapter II (§ 136 et seq.) of chapter 6 of Title 7, Agriculture. For complete classification of this Act to the Code, see Short Title note set out under section 136 of Title 7 and Tables.

The Resource Conservation and Recovery Act, referred to in subsec. (k)(3)(C), probably means the Resource Conservation and Recovery Act of 1976, Pub. L. 94–580, Oct. 21, 1976, 90 Stat. 2796, as amended, which is classified generally to chapter 82 (§ 6901 et seq.) of this title. For complete classification of this Act to the Code, see Short Title of 1976 Amendment note set out under section 6901 of this title and Tables.

The Safe Drinking Water Act, referred to in subsec. (m)(1)(D), (5)(D), is title XIV of act July 1, 1944, as added Dec. 16, 1974, Pub. L. 93–523, § 2(a), 88 Stat. 1660, which is classified generally to subchapter XII (§ 300f et seq.) of chapter 6A of this title. For complete classification of this Act to the Code, see Short Title note set out under section 201 of this title and Tables.

The Solid Waste Disposal Act, referred to in subsec. (n)(7), is title II of Pub. L. 89–272, Oct. 20, 1965, 79 Stat. 997, as amended generally by Pub. L. 94–580, § 2, Oct. 21, 1976, 90 Stat. 2795. Subtitle C of the Act is classified generally to subchapter III (§ 6921 et seq.) of chapter 82 of this title. For complete classification of this Act to the Code, see Short Title note set out under section 6901 of this title and Tables.

Section 303 of the Clean Air Act Amendments of 1990, referred to in subsec. (*o*)(4), probably means section 303 of Pub. L. 101–549, which is set out below.

The Clean Air Act Amendments of 1990, referred to in subsec. (q)(1)–(3), probably means Pub. L. 101–549, Nov. 15, 1990, 104 Stat. 2399. For complete classification of this Act to the Code, see Short Title note set out under section 7401 of this title and Tables.

The Emergency Planning and Community Right-To-Know Act of 1986, referred to in subsec. (r)(3), is title III of Pub. L. 99–499, Oct. 17, 1986, 100 Stat. 1728, which is classified generally to chapter 116 (§ 11001 et seq.) of this title. For complete classification of this Act to the Code, see Short Title note set out under section 11001 of this title and Tables.

The Occupational Safety and Health Act, referred to in subsec. (r)(6)(C)(ii), (K), (L), probably means the Occupational Safety and Health Act of 1970, Pub. L. 91–596, Dec. 29, 1970, 84 Stat. 1590, as amended, which is classified principally to chapter 15 (§ 651 et seq.) of Title 29, Labor. For complete classification of this Act to the Code, see Short Title note set out under section 651 of Title 29 and Tables.

Codification

In subsec. (r)(6)(N), "section 6101 of title 41" substituted for "section 5 of title 41 of the United States Code" on authority of Pub. L. 111–350, § 6(c), Jan. 4, 2011, 124 Stat. 3854, which Act enacted Title 41, Public Contracts.

Section was formerly classified to section 1857c–7 of this title.

Amendments

1999—Subsec. (r)(2)(D). Pub. L. 106–40, § 2(5), added subpar. (D).

Subsec. (r)(4). Pub. L. 106–40, § 2, substituted "Administrator—

"(A) shall consider—"

for "Administrator shall consider each of the following criteria—" in introductory provisions, redesignated subpars. (A) to (C) as cls. (i) to (iii), respectively, of subpar. (A) and added subpar. (B).

Subsec. (r)(7)(H). Pub. L. 106–40, § 3(a), added subpar. (H).

1998—Subsec. (n)(2)(C). Pub. L. 105–362 substituted "On completion of the study, the Secretary shall submit to Congress a report on the results of the study and" for "The Secretary shall prepare annual reports to Congress on the status of the research program and at the completion of the study".

1991—Subsec. (b)(1). Pub. L. 102–187 struck out ''7783064 Hydrogen sulfide'' from list of pollutants.

1990—Pub. L. 101–549 amended section generally, substituting present provisions for provisions which related to: in subsec. (a), definitions; in subsec. (b), list of hazardous air pollutants, emission standards, and pollution control techniques; in subsec. (c), prohibited acts and exemption; in subsec. (d), State implementation and enforcement; and in subsec. (e), design, equipment, work practice, and operational standards.

1978—Subsec. (e)(5). Pub. L. 95–623 added par. (5).

1977—Subsec. (a)(1). Pub. L. 95–95, § 401(c), substituted ''causes, or contributes to, air pollution which may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness'' for ''may cause, or contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness''.

Subsec. (d)(1). Pub. L. 95–95, § 109(d)(2), struck out ''(except with respect to stationary sources owned or operated by the United States)'' after ''implement and enforce such standards''.

Subsec. (e). Pub. L. 95–95, § 110, added subsec. (e).

Statistical Notes and Related Subsidiaries

CHANGE OF NAME

Committee on Energy and Commerce of House of Representatives treated as referring to Committee on Commerce of House of Representatives by section 1(a) of Pub. L. 104–14, set out as a note preceding section 21 of Title 2, The Congress. Committee on Commerce of House of Representatives changed to Committee on Energy and Commerce of House of Representatives, and jurisdiction over matters relating to securities and exchanges and insurance generally transferred to Committee on Financial Services of House of Representatives by House Resolution No. 5, One Hundred Seventh Congress, Jan. 3, 2001.

EFFECTIVE DATE OF 1977 AMENDMENT

Amendment by Pub. L. 95–95 effective Aug. 7, 1977, except as otherwise expressly provided, see section 406(d) of Pub. L. 95–95, set out as a note under section 7401 of this title.

TERMINATION OF REPORTING REQUIREMENTS

For termination, effective May 15, 2000, of provisions of law requiring submittal to Congress of any annual, semiannual, or other regular periodic report listed in House Document No. 103–7 (in which reports required under subsecs. (m)(5), (r)(6)(C)(ii), and (s) of this section are listed, respectively, as the 8th item on page 162, the 9th item on page 198, and the 9th item on page 162), see section 3003 of Pub. L. 104–66, as amended, set out as a note under section 1113 of Title 31, Money and Finance.

PENDING ACTIONS AND PROCEEDINGS

Suits, actions, and other proceedings lawfully commenced by or against the Administrator or any other officer or employee of the United States in his official capacity or in relation to the discharge of his official duties under act July 14, 1955, the Clean Air Act, as in effect immediately prior to the enactment of Pub. L. 95–95 [Aug. 7, 1977], not to abate by reason of the taking effect of Pub. L. 95–95, see section 406(a) of Pub. L. 95–95, set out as an Effective Date of 1977 Amendment note under section 7401 of this title.

MODIFICATION OR RESCISSION OF RULES, REGULATIONS, ORDERS, DETERMINATIONS, CONTRACTS, CERTIFICATIONS, AUTHORIZATIONS, DELEGATIONS, AND OTHER ACTIONS

All rules, regulations, orders, determinations, contracts, certifications, authorizations, delegations, or other actions duly issued, made, or taken by or pursuant to act July 14, 1955, the Clean Air Act, as in effect immediately prior to the date of enactment of Pub. L. 95–95 [Aug. 7, 1977] to continue in full force and effect until modified or rescinded in accordance with act July 14, 1955, as amended by Pub. L. 95–95 [this chapter], see section 406(b) of Pub. L. 95–95, set out as an Effective Date of 1977 Amendment note under section 7401 of this title.

REPORTS

Pub. L. 106–40, § 3(b), Aug. 5, 1999, 113 Stat. 213, provided that:

''(1) DEFINITION OF ACCIDENTAL RELEASE.—In this subsection, the term 'accidental release' has the meaning given the term in section 112(r)(2) of the Clean Air Act (42 U.S.C. 7412(r)(2)).

''(2) REPORT ON STATUS OF CERTAIN AMENDMENTS.—Not later than 2 years after the date of enactment of this Act [Aug. 5, 1999], the Comptroller General of the United States shall submit to Congress a report on the status of the development of amendments to the National Fire Protection Association Code for Liquefied Petroleum Gas that will result in the provision of information to local emergency response personnel concerning the off-site effects of accidental releases of substances exempted from listing under section 112(r)(4)(B) of the Clean Air Act (as added by section 3).

''(3) REPORT ON COMPLIANCE WITH CERTAIN INFORMATION SUBMISSION REQUIREMENTS.—Not later than 3 years after the date of enactment of this Act, the Comptroller General of the United States shall submit to Congress a report that—

''(A) describes the level of compliance with Federal and State requirements relating to the submission to local emergency response personnel of information intended to help the local emergency response personnel respond to chemical accidents or related environmental or public health threats; and

''(B) contains an analysis of the adequacy of the information required to be submitted and the efficacy of the methods for delivering the information to local emergency response personnel.''

REEVALUATION OF REGULATIONS

Pub. L. 106–40, § 3(c), Aug. 5, 1999, 113 Stat. 213, provided that: ''The President shall reevaluate the regulations promulgated under this section within 6 years after the enactment of this Act [Aug. 5, 1999]. If the President determines not to modify such regulations, the President shall publish a notice in the Federal Register stating that such reevaluation has been completed and that a determination has been made not to modify the regulations. Such notice shall include an explanation of the basis of such decision.''

PUBLIC MEETING DURING MORATORIUM PERIOD

Pub. L. 106–40, § 4, Aug. 5, 1999, 113 Stat. 214, provided that:

''(a) IN GENERAL.—Not later than 180 days after the date of enactment of this Act [Aug. 5, 1999], each owner or operator of a stationary source covered by section 112(r)(7)(B)(ii) of the Clean Air Act [42 U.S.C. 7412(r)(7)(B)(ii)] shall convene a public meeting, after reasonable public notice, in order to describe and discuss the local implications of the risk management plan submitted by the stationary source pursuant to section 112(r)(7)(B)(iii) of the Clean Air Act, including a summary of the off-site consequence analysis portion of the plan. Two or more stationary sources may conduct a joint meeting. In lieu of conducting such a meeting, small business stationary sources as defined in section 507(c)(1) of the Clean Air Act [42 U.S.C. 7661f(c)(1)] may comply with this section by publicly posting a summary of the off-site consequence analysis information for their facility not later than 180 days after the enactment of this Act. Not later than 10 months after the date of enactment of this Act, each such owner or operator shall send a certification to the director of the Federal Bureau of Investigation stating that such meeting has been held, or that such summary has been posted, within 1 year prior to, or within 6 months after, the date of the enactment of this Act. This section shall not apply to sources that employ only Program 1 processes within the meaning of regulations promulgated under section 112(r)(7)(B)(i) of the Clean Air Act.

''(b) ENFORCEMENT.—The Administrator of the Environmental Protection Agency may bring an action in the appropriate United States district court against any person who fails or refuses to comply with the requirements of this section, and such court may issue such orders, and take such other actions, as may be necessary to require compliance with such requirements.''

RISK ASSESSMENT AND MANAGEMENT COMMISSION

Pub. L. 101–549, title III, § 303, Nov. 15, 1990, 104 Stat. 2574, provided that:

''(a) ESTABLISHMENT.—There is hereby established a Risk Assessment and Management Commission (hereafter referred to in this section as the 'Commission'), which shall commence proceedings not later than 18 months after the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] and which shall make a full investigation of the policy implications and appropriate uses of risk assessment and risk management in regulatory programs under various Federal laws to prevent cancer and other chronic human health effects which may result from exposure to hazardous substances.

''(b) CHARGE.—The Commission shall consider—

''(1) the report of the National Academy of Sciences authorized by section 112(*o*) of the Clean Air Act [42 U.S.C. 7412(*o*)], the use and limitations of risk assessment in establishing emission or effluent standards, ambient standards, exposure standards, acceptable concentration levels, tolerances or other environmental criteria for hazardous substances that present a risk of carcinogenic effects or other chronic health effects and the suitability of risk assessment for such purposes;

''(2) the most appropriate methods for measuring and describing cancer risks or risks of other chronic health effects from exposure to hazardous substances considering such alternative approaches as the lifetime risk of cancer or other effects to the individual or individuals most exposed to emissions from a source or sources on both an actual and worst case basis, the range of such risks, the total number of health effects avoided by exposure reductions, effluent standards, ambient standards, exposures standards, acceptable concentration levels, tolerances and other environmental criteria, reductions in the number of persons exposed at various levels of risk, the incidence of cancer, and other public health factors;

''(3) methods to reflect uncertainties in measurement and estimation techniques, the existence of synergistic or antagonistic effects among hazardous substances, the accuracy of extrapolating human health risks from animal exposure data, and the existence of unquantified direct or indirect effects on human health in risk assessment studies;

''(4) risk management policy issues including the use of lifetime cancer risks to individuals most exposed, incidence of cancer, the cost and technical feasibility of exposure reduction measures and the use of site-specific actual exposure information in setting emissions standards and other limitations applicable to sources of exposure to hazardous substances; and

''(5) and comment on the degree to which it is possible or desirable to develop a consistent risk assessment methodology, or a consistent standard of acceptable risk, among various Federal programs.

''(c) MEMBERSHIP.—Such Commission shall be composed of ten members who shall have knowledge or experience in fields of risk assessment or risk management, including three members to be appointed by the President, two members to be appointed by the Speaker of the House of Representatives, one member to be appointed by the Minority Leader of the House of Representatives, two members to be appointed by the Majority Leader of the Senate, one member to be appointed by the Minority Leader of the Senate, and one member to be appointed by the President of the National Academy of Sciences. Appointments shall be made not later than 18 months after the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990].

''(d) ASSISTANCE FROM AGENCIES.—The Administrator of the Environmental Protection Agency and the heads of all other departments, agencies, and instrumentalities of the executive branch of the Federal Government shall, to the maximum extent practicable, assist the Commission in gathering such information as the Commission deems necessary to carry out this section subject to other provisions of law.

''(e) STAFF AND CONTRACTS.—

''(1) In the conduct of the study required by this section, the Commission is authorized to contract (in accordance with Federal contract law) with nongovernmental entities that are competent to perform research or investigations within the Commission's mandate, and to hold public hearings, forums, and workshops to enable full public participation.

''(2) The Commission may appoint and fix the pay of such staff as it deems necessary in accordance with the provisions of title 5, United States Code. The Commission may request the temporary assignment of personnel from the Environmental Protection Agency or other Federal agencies.

''(3) The members of the Commission who are not officers or employees of the United States, while attending conferences or meetings of the Commission or while otherwise serving at the request of the Chair, shall be entitled to receive compensation at a rate not in excess of the maximum rate of pay for Grade GS–18, as provided in the General Schedule under section 5332 of title 5 of the United States Code, including travel time, and while away from their homes or regular places of business they may be allowed travel expenses, including per diem in lieu of subsistence as authorized by law for persons in the Government service employed intermittently.

''(f) REPORT.—A report containing the results of all Commission studies and investigations under this section, together with any appropriate legislative recommendations or administrative recommendations, shall be made available to the public for comment not later than 42 months after the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] and shall be submitted to the President and to the Congress not later than 48 months after such date of enactment. In the report, the Commission shall make recommendations with respect to the appropriate use of risk assessment and risk management in Federal regulatory programs to prevent cancer or other chronic health effects which may result from exposure to hazardous substances. The Commission shall cease to exist upon the date determined by the Commission, but not later than 9 months after the submission of such report.

''(g) AUTHORIZATION.—There are authorized to be appropriated such sums as are necessary to carry out the activities of the Commission established by this section.''

[References in laws to the rates of pay for GS–16, 17, or 18, or to maximum rates of pay under the General Schedule, to be considered references to rates payable under specified sections of Title 5, Government Organization and Employees, see section 529 [title I, § 101(c)(1)] of Pub. L. 101–509, set out in a note under section 5376 of Title 5.]

Executive Documents

DELEGATION OF AUTHORITY

Memorandum of President of the United States, Aug. 19, 1993, 58 F.R. 52397, provided:

Memorandum for the Administrator of the Environmental Protection Agency

WHEREAS, the Environmental Protection Agency, the agencies and departments that are members of the

National Response Team (authorized under Executive Order No. 12580, 52 Fed. Reg. 2923 (1987) [42 U.S.C. 9615 note]), and other Federal agencies and departments undertake emergency release prevention, mitigation, and response activities pursuant to various authorities;

By the authority vested in me as President by the Constitution and the laws of the United States of America, including section 112(r)(10) of the Clean Air Act (the ''Act'') (section 7412(r)(10) of title 42 of the United States Code) and section 301 of title 3 of the United States Code, and in order to provide for the delegation of certain functions under the Act [42 U.S.C. 7401 et seq.], I hereby:

(1) Authorize you, in coordination with agencies and departments that are members of the National Response Team and other appropriate agencies and departments, to conduct a review of release prevention, mitigation, and response authorities of Federal agencies in order to assure the most effective and efficient implementation of such authorities and to identify any deficiencies in authority or resources that may exist, to the extent such review is required by section 112(r)(10) of the Act; and

(2) Authorize you, in coordination with agencies and departments that are members of the National Response Team and other appropriate agencies and departments, to prepare and transmit a message to the Congress concerning the release prevention, mitigation, and response activities of the Federal Government with such recommendations for change in law as you deem appropriate, to the extent such message is required by section 112(r)(10) of the Act.

The authority delegated by this memorandum may be further redelegated within the Environmental Protection Agency.

You are hereby authorized and directed to publish this memorandum in the Federal Register.

WILLIAM J. CLINTON.

Memorandum of President of the United States, Jan. 27, 2000, 65 F.R. 8631, provided:

Memorandum for the Attorney General[,] the Administrator of the Environmental Protection Agency[, and] the Director of the Office of Management and Budget

By the authority vested in me as President by the Constitution and laws of the United States of America, including section 112(r)(7)(H) of the Clean Air Act (''Act'') (42 U.S.C. 7412(r)(7)(H)), as added by section 3 of the Chemical Safety Information, Site Security and Fuels Regulatory Relief Act (Public Law 106–40), and section 301 of title 3, United States Code, I hereby delegate to:

(1) the Attorney General the authority vested in the President under section 112(r)(7)(H)(ii)(I)(aa) of the Act to assess the increased risk of terrorist and other criminal activity associated with the posting of off-site consequence analysis information on the Internet;

(2) the Administrator of the Environmental Protection Agency (EPA) the authority vested in the President under section 112(r)(7)(H)(ii)(I)(bb) of the Act to assess the incentives created by public disclosure of off-site consequence analysis information for reduction in the risk of accidental releases; and

(3) the Attorney General and the Administrator of EPA, jointly, the authority vested in the President under section 112(r)(7)(H)(ii)(II) of the Act to promulgate regulations, based on these assessments, governing the distribution of off-site consequence analysis information. These regulations, in proposed and final form, shall be subject to review and approval by the Director of the Office of Management and Budget.

The Administrator of EPA is authorized and directed to publish this memorandum in the Federal Register.

WILLIAM J. CLINTON.

FLEXIBLE IMPLEMENTATION OF THE MERCURY AND AIR TOXICS STANDARDS RULE

Memorandum of President of the United States, Dec. 21, 2011, 76 F.R. 80727, provided:

Memorandum for the Administrator of the Environmental Protection Agency

Today's issuance, by the Environmental Protection Agency (EPA), of the final Mercury and Air Toxics Standards rule for power plants (the ''MATS Rule'') represents a major step forward in my Administration's efforts to protect public health and the environment.

This rule, issued after careful consideration of public comments, prescribes standards under section 112 of the Clean Air Act to control emissions of mercury and other toxic air pollutants from power plants, which collectively are among the largest sources of such pollution in the United States. The EPA estimates that by substantially reducing emissions of pollutants that contribute to neurological damage, cancer, respiratory illnesses, and other health risks, the MATS Rule will produce major health benefits for millions of Americans—including children, older Americans, and other vulnerable populations. Consistent with Executive Order 13563 (Improving Regulation and Regulatory Review), the estimated benefits of the MATS Rule far exceed the estimated costs.

The MATS Rule can be implemented through the use of demonstrated, existing pollution control technologies. The United States is a global market leader in the design and manufacture of these technologies, and it is anticipated that U.S. firms and workers will provide much of the equipment and labor needed to meet the substantial investments in pollution control that the standards are expected to spur.

These new standards will promote the transition to a cleaner and more efficient U.S. electric power system. This system as a whole is critical infrastructure that plays a key role in the functioning of all facets of the U.S. economy, and maintaining its stability and reliability is of critical importance. It is therefore crucial that implementation of the MATS Rule proceed in a cost-effective manner that ensures electric reliability.

Analyses conducted by the EPA and the Department of Energy (DOE) indicate that the MATS Rule is not anticipated to compromise electric generating resource adequacy in any region of the country. The Clean Air Act offers a number of implementation flexibilities, and the EPA has a long and successful history of using those flexibilities to ensure a smooth transition to cleaner technologies.

The Clean Air Act provides 3 years from the effective date of the MATS Rule for sources to comply with its requirements. In addition, section 112(i)(3)(B) of the Act allows the issuance of a permit granting a source up to one additional year where necessary for the installation of controls. As you stated in the preamble to the MATS Rule, this additional fourth year should be broadly available to sources, consistent with the requirements of the law.

The EPA has concluded that 4 years should generally be sufficient to install the necessary emission control equipment, and DOE has issued analysis consistent with that conclusion. While more time is generally not expected to be needed, the Clean Air Act offers other important flexibilities as well. For example, section 113(a) of the Act provides the EPA with flexibility to bring sources into compliance over the course of an additional year, should unusual circumstances arise that warrant such flexibility.

To address any concerns with respect to electric reliability while assuring MATS' public health benefits, I direct you to take the following actions:

1. Building on the information and guidance that you have provided to the public, relevant stakeholders, and permitting authorities in the preamble of the MATS Rule, work with State and local permitting authorities to make the additional year for compliance with the MATS Rule provided under section 112(i)(3)(B) of the Clean Air Act broadly available to sources, consistent with law, and to invoke this flexibility expeditiously where justified.

2. Promote early, coordinated, and orderly planning and execution of the measures needed to implement the MATS Rule while maintaining the reliability of the electric power system. Consistent with Executive Order 13563, this process should be designed to ''promote pre-

dictability and reduce uncertainty,'' and should include engagement and coordination with DOE, the Federal Energy Regulatory Commission, State utility regulators, Regional Transmission Organizations, the North American Electric Reliability Corporation and regional electric reliability organizations, other grid planning authorities, electric utilities, and other stakeholders, as appropriate.

3. Make available to the public, including relevant stakeholders, information concerning any anticipated use of authorities: (a) under section 112(i)(3)(B) of the Clean Air Act in the event that additional time to comply with the MATS Rule is necessary for the installation of technology; and (b) under section 113(a) of the Clean Air Act in the event that additional time to comply with the MATS Rule is necessary to address a specific and documented electric reliability issue. This information should describe the process for working with entities with relevant expertise to identify circumstances where electric reliability concerns might justify allowing additional time to comply.

This memorandum is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States, its departments, agencies, or entities, its officers, employees, or agents, or any other person.

You are hereby authorized and directed to publish this memorandum in the Federal Register.

BARACK OBAMA.

§ 7413. Federal enforcement

(a) In general

(1) Order to comply with SIP

Whenever, on the basis of any information available to the Administrator, the Administrator finds that any person has violated or is in violation of any requirement or prohibition of an applicable implementation plan or permit, the Administrator shall notify the person and the State in which the plan applies of such finding. At any time after the expiration of 30 days following the date on which such notice of a violation is issued, the Administrator may, without regard to the period of violation (subject to section 2462 of title 28)—

(A) issue an order requiring such person to comply with the requirements or prohibitions of such plan or permit,

(B) issue an administrative penalty order in accordance with subsection (d), or

(C) bring a civil action in accordance with subsection (b).

(2) State failure to enforce SIP or permit program

Whenever, on the basis of information available to the Administrator, the Administrator finds that violations of an applicable implementation plan or an approved permit program under subchapter V are so widespread that such violations appear to result from a failure of the State in which the plan or permit program applies to enforce the plan or permit program effectively, the Administrator shall so notify the State. In the case of a permit program, the notice shall be made in accordance with subchapter V. If the Administrator finds such failure extends beyond the 30th day after such notice (90 days in the case of such permit program), the Administrator shall give public notice of such finding. During the period beginning with such public notice and ending when such State satisfies the Administrator that it will enforce such plan or permit program (hereafter referred to in this section as ''period of federally assumed enforcement''), the Administrator may enforce any requirement or prohibition of such plan or permit program with respect to any person by—

(A) issuing an order requiring such person to comply with such requirement or prohibition,

(B) issuing an administrative penalty order in accordance with subsection (d), or

(C) bringing a civil action in accordance with subsection (b).

(3) EPA enforcement of other requirements

Except for a requirement or prohibition enforceable under the preceding provisions of this subsection, whenever, on the basis of any information available to the Administrator, the Administrator finds that any person has violated, or is in violation of, any other requirement or prohibition of this subchapter, section 7603 of this title, subchapter IV–A, subchapter V, or subchapter VI, including, but not limited to, a requirement or prohibition of any rule, plan, order, waiver, or permit promulgated, issued, or approved under those provisions or subchapters, or for the payment of any fee owed to the United States under this chapter (other than subchapter II), the Administrator may—

(A) issue an administrative penalty order in accordance with subsection (d),

(B) issue an order requiring such person to comply with such requirement or prohibition,

(C) bring a civil action in accordance with subsection (b) or section 7605 of this title, or

(D) request the Attorney General to commence a criminal action in accordance with subsection (c).

(4) Requirements for orders

An order issued under this subsection (other than an order relating to a violation of section 7412 of this title) shall not take effect until the person to whom it is issued has had an opportunity to confer with the Administrator concerning the alleged violation. A copy of any order issued under this subsection shall be sent to the State air pollution control agency of any State in which the violation occurs. Any order issued under this subsection shall state with reasonable specificity the nature of the violation and specify a time for compliance which the Administrator determines is reasonable, taking into account the seriousness of the violation and any good faith efforts to comply with applicable requirements. In any case in which an order under this subsection (or notice to a violator under paragraph (1)) is issued to a corporation, a copy of such order (or notice) shall be issued to appropriate corporate officers. An order issued under this subsection shall require the person to whom it was issued to comply with the requirement as expeditiously as practicable, but in no event longer than one year after the date the order was issued, and shall be nonrenewable. No order issued under this subsection

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June 12, 2023

Honorable Administrator Michael S. Regan
US Environmental Protection Agency
EPA Docket Center (EPA/DC)
Docket ID No. EPA-HQ-OAR-2018-0794
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: Proposed *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil- Fired Electric Steam Generating Units Review of the Residual Risk and Technology Review*

Dear Honorable Administrator Regan,

The National Tribal Air Association (NTAA) is pleased to submit the following comments on the U.S. Environmental Protection Agency's (EPA) proposal: *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil- Fired Electric Steam Generating Units Review of the Residual Risk and Technology Review* as published in the *Federal Register* on April 24, 2023.

The NTAA is a member-based organization with 156 Member Tribes. The organization's mission is to advance air quality management policies and programs, consistent with the needs, interests, and unique legal status of American Indian Tribes and Alaskan Natives. As such, the NTAA uses its resources to support the efforts of all federally recognized Tribes in protecting and improving the air quality within their respective jurisdictions. Although the organization always seeks to represent consensus perspectives on any given issue, it is important to note that the views expressed by the NTAA may not be agreed upon by all Tribes. Further, it is also important to understand that interactions with the organization do not substitute for Nation-to-Nation consultation, which can only be achieved through direct communications between the federal government and American Indian Tribal Governments and Alaskan Natives.

The health, environments, and lifeways of Tribes in much of the U.S. have been impacted by the emissions of mercury and other toxic metals. Electric power generation from coal-fired and oil-fired boilers has been a major contributor to this airborne pollution. Concurrently, these same pollution sources emit acid gases, greenhouse gases and other harmful air pollutants. The NTAA has repeatedly supported regulations to reduce emissions from fossil fuel combustion and the transition to electricity generation from renewable sources. With this letter the NTAA continues that advocacy and support for the proposed regulation as proposed on April 24, 2023.

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Mercury Emissions

American Indians and Alaska Native Villagers are reliant on natural food supplies including fish, game, and native plants. Nutritious foods are crucial components to the ecosystems that have sustained life for thousands of years. Mercury contamination of Tribal environments including fish, shellfish and other essential food supplies injects this potent neurotoxin into our vulnerable population. The NTAA supports the proposed reduction of allowable mercury emissions from lignite – burning electric generating units (EGUs) and enhanced emissions monitoring from all coal – fired and oil – fired EGUs.

Emissions of Other Metals and Toxins

Fossil fuels, and coal and oil more specifically, contain multiple impurities that, when released into the environment, can cause significant adverse effects to human health and other life forms. Arsenic, chromium, cobalt and lead, commonly found in coal, are potent threats to human health. Acid gases formed from chlorine and fluorine are insidious with multiple harmful effects. The NTAA supports the proposal for more stringent controls of the emissions from coal – fired and oil – fired EGUs through limits on fine particulate matter (fPM). To the extent that these hazardous air pollutants are not addressed adequately through this surrogate regulation, additional requirements may be necessary.

Greenhouse Gases and Climate Change

As noted in the *Fact Sheet* accompanying the proposed regulation[1], "…the proposed rule is one part of a broader suite of actions that Administrator Regan announced in March 2022 to protect communities across the nation from the various health and environmental impacts of power plant pollution." In addition to mercury and other air toxins from coal – fired and oil – fired EGUs, this industrial sector is a primary source of greenhouse gases. The acute and continuous impacts of climate change on Native Americans and Alaska Native Villagers are well documented. Unfortunately, new consequences of this global crisis continue to be revealed. For multiple reasons including vulnerability and geographic constraints Tribal communities are disproportionately suffering from these changes. The U.S. Fourth National Climate Assessment (NCA_4)[2] noted, in part, that "Climate change increasingly threatens indigenous communities' livelihoods, economies, health, and cultural identities by disrupting interconnected social, physical, and ecological systems." A more focused examination of Tribal needs to address the impacts of climate change is presented in 2021 publication *The Status of Tribes and Climate Change (STACC)*[3].

The NTAA has a long history of information sharing with EPA and advocacy for reducing emissions of greenhouse gases. Multiple reports, policy statements, and comment letters are compiled and accessible at our organization's web-site[4]. NTAA's *Status of Tribal Air Reports* (STAR) including STAR 2022[5] document climate change impacts on Tribal lands and people. The ravages of climate change continue to be of the utmost concern to the NTAA. The NTAA supports this proposed regulation as one part of the efforts to reduce reliance on coal – fired and oil – fired EGUs.

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Conclusions

In closing, the NTAA appreciates the opportunity to comment on the proposed rule regarding the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil- Fired Electric Steam Generating Units Review of the Residual Risk and Technology Review."

Respectfully,

Syndi Smallwood
Chair
Executive Committee, National Tribal Air Association

[1]*FACT SHEET,* EPA's Proposal to Strengthen and Update the Mercury and Air Toxics Standards for Power Plants
[2]*USGCRP, 2018: Impacts, Risks, and Adaptation in the United States*
[3] *The Status of Tribes and Climate Change (STACC)*, Institute for Tribal Environmental Professionals, 2021
[4]National Tribal Air Association, www.ntaatribalair.org
[5] *Status of Tribal Air Report*, National Tribal Air Association 2022

Cc: Pat Childers, Senior Tribal Program Coordinator, OAR
Carolyn Kelly, Program Manager, NTAA

Transmittal Form

Date Submitted:_6/16/2023____

Due Date:_6/21/2023________

Department: **Environmental Programs, Air Quality**

Document: UMUT comment review of EPA's Proposed National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Steam Generating Units.

Comments: EPA's new rule requires more stringent controls on Mercury emissions and other hazardous pollutants from Coal-Fired Electric Generating Units which would positively impact the air near and on the Reservation and NA communities across the nation.

REVIEW STATUS:

JUSTICE

Comments **Reviewed by:** MG **Date:** 6/16/23

Okay to sign

Approved by: [illegible] **Date:** 6/16/23

Finance -- Grants

Comments **Reviewed by:** PL **Date:** 6/23/2023

No Financial Impact

Approved by: [illegible] **Date:** 6/23/23

ADMINISTRATION – Executive Director

Comments **Reviewed by:** J Trocheck **Date:** 6/23/23

OK

Approved by: John Trocheck **Date:** 6/23/23

UTE MOUNTAIN UTE TRIBE

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June 20, 2023

US Environmental Protection Agency
EPA Docket Center (EPA/DC)
Docket ID No. EPA-HQ-OAR-2018-0794
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: Comments from the **Ute Mountain Ute Tribe** on EPA's Proposed National Emission Standards for Hazardous Air Pollutants: Coal- and Oil- Fired Electric Steam Generating Units Review of the Residual Risk and Technology Review: Docket ID No. EPA-HQ-OAR-2018-0794

The Ute Mountain Ute Tribe is pleased to submit these comments and recommendations regarding the U.S. Environmental Protection Agency's (EPA's) Proposed National Emission Standards for Hazardous Air Pollutants: Coal- and Oil- Fired Electric Steam Generating Units Review of the Residual Risk and Technology as published in the *Federal Register* on April 24, 2023[1].

The health, environments, and lifeways of Tribes in much of the U.S., including the Ute Mountain Ute Tribe have been impacted by emissions of mercury and other toxic metals. Until closing in 2022, the San Juan Generation Plant in Kirkland, NM, the Ute Mountain Ute Tribal Reservation lands have been impacted by two electrical power generating units within less than 50 km of the boundaries. The Tribe is impacted by only one currently. Electric power generation from the coal-fired boilers has been a major contributor to airborne pollution in the area and Tribal airshed. Concurrently, these same pollution sources emit acid gases, greenhouse gases, and other harmful air pollutants. The Ute Mountain Ute Tribe has supported regulations to reduce emissions from fossil fuel combustion and the transition to electricity generation from renewable sources. With this letter we continue that advocacy and support for the proposed regulation as proposed on April 24.

The EPA cites a report from 2021 that mercury emissions from coal-fired electric generating units (EGUs) have decreased by 90 percent since the initial MATS requirements of 2012.[5] Thus, the current proposed standards would change requirements for reduced mercury emissions in two focused ways. First, coal fired EGUs that burn lignite would be required to meet the same emissions standards as those burning other types of coal i.e., 1.2 pounds per trillion Btus of heat input (1.2 lbs/TBtu). The current limit for these facilities is 4.0 lbs/TBtu. Lignite-burning EGUs are located almost exclusively at or near lignite deposits and mines in the upper Midwest. Second, mercury emissions during start-up procedures for all coal fired EGUs would be reduced by eliminating one of the procedural options now authorized. The EPA anticipates that compliance with both of these revisions can be achieved by deploying available and affordable technologies or methods of operation.[2]

More stringent requirements are proposed for emissions limits on hazardous air pollutants including nickel, arsenic, lead, chromium, cobalt and other "non-mercury HAP metals". These pollutants currently are limited indirectly as filterable Particulate Matter (fPM). The current maximum allowable emission rate of 0.030 pounds of fPM per million British thermal units (0.030 lbs/MMBtu) would be reduced to 0.010 lbs/MMBtu. Importantly, the EPA projects that 91% of current coal fired EGU production currently will meet the proposed standard following full compliance.[2]

When fully implemented the proposed rule is expected to result in emissions reductions of other air pollutants. These hazardous air pollutants include acid gases such as hydrogen chloride (HCl) and hydrogen fluoride (HF) plus organic pollutants including formaldehyde and dioxin/furan.

American Indians and Alaska Native Villagers are reliant on natural food supplies including fish, game, and native plants. Nutritious foods are crucial components to the ecosystems that have sustained life for thousands of years. The Ute Mountain Ute Tribe has a history of and continues to depend on these indigenous supplies of food and other important resources for traditional practices. Mercury contamination of Tribal environments including fish, shellfish and other essential food supplies injects this potent neurotoxin into our vulnerable populations and we support the proposed reduction of allowable mercury emissions from lignite-burning electric generating units (EGUs) and enhanced emissions monitoring from all coal-fired and oil-fired EGUs.

Fossil fuels, and coal and oil more specifically, contain multiple impurities that, when released into the environment, can cause significant adverse effects to human health and other life forms. Arsenic, chromium, cobalt, and lead, commonly found in coal, are potent threats to human health. Acid gases formed from chlorine and fluorine are insidious with multiple harmful effects. The Ute Mountain Ute Tribe supports the proposal for more stringent controls of the emissions from coal-fired and oil-fired EGUs s through limits on fine particulate matter (fPM). To the extent that these hazardous air pollutants are not addressed adequately through this surrogate regulation, additional requirements may be necessary.

As noted in the *Fact Sheet* accompanying the proposed regulation, "…the proposed rule is one part of a broader suite of actions that Administrator Regan announced in March 2022 to protect communities across the nation from the various health and environmental impacts of power plant pollution." In addition to mercury and other air toxins from coal-fired and oil-fired EGUs, this industrial sector is a primary source of greenhouse gases. The acute and continuous impacts of climate change on Native Americans and Alaska Native Villagers are well documented.

pollution." In addition to mercury and other air toxins from coal-fired and oil-fired EGUs, this industrial sector is a primary source of greenhouse gases. The acute and continuous impacts of climate change on Native Americans and Alaska Native Villagers are well documented. Unfortunately, new consequences of this global crisis continue to be revealed. For multiple reasons including vulnerability and geographic constraints, Tribal communities are disproportionately suffering from these changes.

The acute and continuous impacts of climate change on Ute Mountain Ute Tribe are well documented. Unfortunately, new consequences of this global crisis continue to be revealed. The ravages of climate change continue to be of utmost concern to the Ute Mountain Ute Tribe. We support this proposed regulation as one part of efforts to reduce reliance on coal-fired and oil-fired EGUs.

In conclusion, the Ute Mountain Ute Tribe supports this important set of proposed regulations regarding air pollution emissions from coal – fired and oil – fired electric steam generating units and their potential to reduce the many harmful impacts of mercury and other airborne toxins. If there are any questions on these comments, please contact Janice Archuleta, Air Quality Manager at Jarchuleta@utemountain.org.

Respectfully submitted by

Manuel Heart

Manuel Heart, Chairman
Ute Mountain Ute Tribe

[1] Federal Register/ Vol. 88, No. 78/Monday, April 24, 2023

[2] **FACT SHEET**: EPA's Proposal to Strengthen and Update the Mercury and Air Toxics Standards for Power Plants

Via Regulations.gov and email: *a-and-r-docket@epa.gov*

June 23, 2023

Administrator Michael Regan
U.S. Environmental Protection Agency
William Jefferson Clinton Building
1200 Pennsylvania Ave., NW
Washington, DC 20004

Re: Docket ID No. EPA–HQ–OAR–2018–0794, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*

Dear Administrator Regan:

Please accept these comments regarding the *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*, submitted on behalf of the Fond du Lac Band of Lake Superior Chippewa, Grand Traverse Band of Ottawa and Chippewa Indians, and Little Traverse Bay Bands of Odawa Indians. The Tribes appreciate the opportunity to comment upon the Environmental Protection Agency's review of the Residual Risk and Technology Review (RTR) for the Mercury and Air Toxics Standards for coal- and oil-fired electric utility generating units, and strongly support the agency's proposal to update and strengthen the Mercury and Air Toxics Standards (MATS). As reflected by more than a decade of active tribal participation in EPA's development and implementation of MATS, this rule is of particular importance to the health and cultural integrity of many Native American Tribes. We support the proposal to strengthen the vital MATS emission standards and related provisions, and we urge EPA to finalize a rule that takes account of important developments since the MATS standards were finalized more than a decade ago and available technologies to provide the strongest possible protection against emissions of mercury and other hazardous air pollutants (HAPs) from coal- and oil-fired electric utility steam generating units.

On April 11, 2022, a coalition of tribes and tribal organizations, including tribes represented here, submitted comments and supporting materials on EPA's proposal to revoke the 2020 rescission, and to reaffirm the finding that it is appropriate and necessary to regulate coal- and oil-fired electric generating units under section 112 of the Clean Air Act. See Attachment A. The same interests in protecting tribal members' health, tribal resources, and tribal cultural practices that supported reaffirmation of EPA's appropriate and necessary finding support strengthening the MATS emissions standards and improving emissions monitoring. Accordingly, we attach and incorporate by reference our 2022 submission to this letter, and we ask that they be included in the administrative record for this rulemaking.

As those comments explained, the serious harms attributable to emissions of hazardous air pollutants from coal-fired power plants are not evenly distributed across society. Many tribal members are particularly at risk of exposure to methylmercury, in part because of the prevalence among many tribes of subsistence fishing and particularly high rates of fish consumption. *See*

April 11, 2022 Comments at 2-3. In addition to disproportionate health risks, mercury and other toxic pollution, through contamination of water and harm to wildlife, poses serious threats to traditional tribal cultural practices. See *id*. at 3-4. All these reasons support EPA's efforts to continue the build upon the progress achieved so far and strengthen standards to further reduce HAP emissions.

The scientific record concerning the nature and distribution of harm from HAPs continues to grow even stronger. A recent study by researchers at Harvard's John A. Paulson School of Engineering and Applied Sciences found that vulnerable populations – including those with lower-income individuals – are disproportionately represented in communities within 5 km of coal-burning power plants that are still in operation after full implementation of the 2012 MATS rule.[1] Notably, the researchers further found that regions with lower-than-average reductions in mercury deposition attributable to coal-fired power plants between 2010 and 2020 overlap with regions with higher-than-average numbers of high-frequency fish consumers, including in areas where members of tribal communities live.[2] In addition, the highest-mercury-emitting power plants include lignite coal plants in North Dakota, plants located near large Native American populations; their emissions would would be reduced by the proposed rule's tightening of emission limits for such plants, which should be set much lower than EPA has proposed. Reducing these emissions is critical because pollution from the coal-fired plants is responsible for up to 8 percent of local deposition of mercury, leading to concentrations of methylmercury in fish-tissue samples that are high enough to harm sensitive individuals. See *id*. p. E & Figure S4. We urge EPA to strengthen MATS to address these remaining risks and to reflect current pollution-control technologies, as it is required to do by the Clean Air Act.

Because of the importance of reducing these harms, including for tribes and their members, we urge EPA to strengthen the MATS emissions standards. We also support EPA's proposal to improve transparency for local communities by requiring use of Continuous Emissions Monitoring Systems.

Thank you for the opportunity to provide comments on this important matter. If you would like to discuss these comments or have questions, please contact me at jsteadman@kanjikatzen.com.

Respectfully submitted,

Jane Steadman

Jane Steadman
Kanji & Katzen, P.L.L.C.

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[1] Mona Q. Dai, Benjamin M. Geyman, Xindi C. Hu, Colin P. Thackray, and Elsie M. Sunderland, *Sociodemographic Disparities in Mercury Exposure from United States Coal-Fired Power Plants*, Environ. Sci. Tech. Lett. (2023), available at https://doi.org/10.1021/acs.estlett.3c00216 and attached as Attachment B.

[2] See id. p. D ("Lowest reductions in Hg deposition from U.S. power plants occurred in parts of North Dakota, Texas, and Nevada (Figure2). We find clustering of these regions with lower than average reductions in deposition that overlap regions with higher than average numbers of high-frequency fish consumers, especially in North and South Dakota, and parts of Montana (Figure S3).The Dakotas have a high proportion of American Indians, who frequently consume fish, and many recreational fisheries are in this area.").

-WOHEHIV-
The Morning Star

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-WOHEHIV-
The Morning Star

June 23, 2023

Sarah Benish
Sector Policies and Programs Division
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Re: Proposal on National Emissions Standards for Hazardous Air Pollutants: Coal and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, **Docket ID No. EPA–HQ–OAR–2018–0794**

Dear Ms. Benish:

I write on behalf of the Northern Cheyenne Tribe, a federally recognized Tribe based on the Northern Cheyenne Reservation in southeastern Montana, to urge EPA to finalize protective Mercury and Air Toxics Standards (MATS) and to reject claims by the owners of the Colstrip coal plant that would continue to subject tribal members to unhealthy air.

The Northern Cheyenne Reservation is twenty miles from Colstrip, Montana and the Colstrip coal-fired power plant. Since the Colstrip plant was first proposed, the Tribe has taken steps to protect its people from the harmful effects of air pollution from the plant, which disproportionately impacts tribal members. For example, concerned about the proposed construction of Colstrip Units 3 and 4, in 1976 the Tribe proposed to redesignate the Reservation as a Class I airshed under the Clean Air Act. After EPA approved the Tribe's proposal in 1977, the Tribe exercised its authority to require additional air pollution controls on the new Colstrip units.

The Tribe supports EPA's efforts to establish appropriate limits on Colstrip's emissions of hazardous air pollutants. EPA explains, exposure to these pollutants harms human health, including "potential neurodevelopmental impairment, increased cancer risks, and contribution to chronic and acute health disorders, as well as adverse impacts on the environment." Final Rule, Revocation of the 2020 Reconsideration and Affirmation of the Appropriate and Necessary Supplemental Finding, 88 Fed. Reg. 13,956, 13,968 (Mar. 6, 2023). Because of the proximity of the Northern Cheyenne tribal members to the Colstrip plant—living both on the Reservation and in the nearby community of Colstrip, where many tribal members are employed—they are disproportionately impacted by exposure to hazardous air pollutants.

Although cost-effective pollution controls are available to reduce toxic air emissions from Colstrip Units 3 and 4, namely baghouses and electrostatic precipitators, Colstrip's owners have refused to install them. As a result, Colstrip has the highest rate of filterable particulate matter emissions (a surrogate for non-mercury hazardous air pollutants) in the country and is the only plant still operating without industry-standard particulate matter controls. Colstrip has a history of exceeding even the current standard for non-mercury hazardous air pollutants.

Two of Colstrip's owners—NorthWestern Energy and Talen Montana—and Rosebud mine owner Westmoreland oppose EPA's proposal to strengthen the MATS to align with Clean Air Act requirements. According to the companies, compliance with lower limits for non-mercury hazardous air pollutants would be too costly. Such arguments irresponsibly ignore the acute health effects—including premature deaths—that Colstrip's toxic emissions have on Northern Cheyenne tribal members and the many others who live in close proximity to the plant.

The Tribe urges EPA to finalize protective MATS. Under the new standards, Colstrip Units 3 and 4 should be required to install the same controls that other plants around the country have already installed and to operate those controls to achieve maximum emissions reductions, as the Clean Air Act requires. 42 U.S.C. § 7412(d)(2), (f).

Respectfully,

William Walks Along, Tribal Administrator
Northern Cheyenne Tribe

June 23, 2023

Via electronic transmission

U.S. Environmental Protection Agency
EPA Docket Center
Mail Code 28221T
1200 Pennsylvania Ave. NW
Washington, DC 20460
a-and-r-docket@epa.gov

Attention: Docket ID No. EPA-HQ-OAR-2018-0794

The Attorneys General of Massachusetts, Minnesota, Connecticut, Illinois, Maine, Maryland, Michigan, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, and Wisconsin, and the Cities of Baltimore, Chicago, and New York; ("Attorneys General and Local Governments") respectfully submit these comments on the Environmental Protection Agency's ("EPA") proposal entitled "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review" ("Proposal").[1] The Proposal is the result of EPA's review of its 2020 "residual risk and technology review" ("2020 RTR")[2] of the current limits on power-plant hazardous air pollutant ("HAP") emissions ("Standards") promulgated as part of the 2012 Mercury and Air Toxics Standards Rule ("MATS Rule").[3]

The Attorneys General and Local Governments strongly support EPA's Proposal to strengthen certain of the Standards as part of its technology review under section 112(d)(6) of the Clean Air Act, 42 U.S.C. § 7412(d)(6).[4] Because many members of our coalition are downwind of power plants with significant HAP emissions, our residents and natural resources continue to suffer from substantial exposure to mercury and other power-plant hazardous air pollution.

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[1] 88 Fed. Reg. 24,854 (Apr. 24, 2023).
[2] 85 Fed. Reg. 31,286, 31,314-19 (May 22, 2020).
[3] 77 Fed. Reg. 9304, 9366-76 (Feb. 16, 2012).
[4] In the Proposal, EPA is reconsidering both the section 112(f)(2) residual risk review and the section 112(d)(6) technology review completed as part of the 2020 RTR, but does not propose any revisions to the 2020 residual risk review, which found a low residual risk from HAP emissions from coal- and oil-fired power plants, under the section 112(f)(2) "ample margin of safety to protect public health" standard. 88 Fed. Reg. at 24,866. The Attorneys General and Local Governments' comments focus on the technology review component of the 2020 RTR. We note, however, that several commenters on EPA's 2022 "appropriate and necessary" finding reconsideration submitted additional information on the public health impacts of HAP emissions from coal- and oil-fired power plants that EPA should evaluate as part of its reconsideration of the 2020 RTR. *See* Comment submitted by Emmett Environmental Law & Policy Clinic on Behalf of Elsie M. Sunderland, et al., EPA–HQ–OAR–2018–0794–4954 (Apr. 12, 2022); Comments of Public Health and Environmental Organizations, EPA–HQ–OAR–2018–0794–4581, at 29-49 (Apr. 11, 2022) ("2022 NGO Comments").

Strengthening the Standards would meaningfully reduce the ongoing serious health and environmental risks posed by such pollutants, especially to people in underserved communities[5] that historically have been marginalized and environmentally overburdened.

At the same time, as EPA has recognized,[6] annual compliance costs for the industry have been significantly lower than EPA estimated in 2011, due in part to improvements and cost reductions in pollution controls.[7] Moreover, many states have for years been controlling mercury emissions under state law at reasonable cost and often under stricter standards than the MATS Rule.[8]

Accordingly, we agree with EPA that more stringent limits on emissions of mercury from lignite coal-burning units and non-mercury metals from all coal-fired units are "necessary" under section 112(d)(6)'s technology review. We also urge EPA to impose more stringent limits on mercury emissions from nonlignite coal-fired units consistent with the standards that coal-fired plants have been complying with in many of our jurisdictions for years. Finally, we ask that EPA evaluate more stringent HCl limits for acid gases, since recent analysis confirms that a lower HCl limit is likely achievable.

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[5] As used here, "underserved communities" means "populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life," including "Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality." *See* Executive Order 13,985 § 2, 86 Fed. Reg. 7009 (Jan. 25, 2021).

[6] 87 Fed. Reg. 7624, 7651 (Feb. 9, 2022).

[7] Barbara Morin & Paul J. Miller, Northeast States for Coordinated Air Use Mgmt. ("NESCAUM"), *It Remains "Appropriate and Necessary" to Regulate Toxic Air Emissions from Coal- and Oil-fired Electric Generating Units* 11 (Apr. 7, 2022), https://www.nescaum.org /documents /nescaum-it-remains-approp-necess-reg-air-toxics-from-coal-oil-egus-update-20220407.pdf.

[8] *See id.* at 10; Comments of the National Association of Clean Air Agencies on EPA's Proposed Supplemental Finding, Doc. ID No. EPA-HQ-OAR-2009-0234-17620, at 7 (Aug. 4, 2011) ("To our knowledge, no source has failed to comply with state deadlines for achieving [mercury] limitations, and no significant adverse impacts on electric system reliability were encountered as units were upgraded to meet state requirements."); *id.* at 6 ("Years, and in some cases decades, of experience demonstrates that [the technologies available to reduce power plant hazardous air pollutant emissions] can reliably deliver the expected performance at reasonable cost.").

DETAILED COMMENTS

I. Power-Plant HAP Emissions Are Causing Ongoing Harms Within the Jurisdictions of the Attorneys General and Local Governments That More Stringent Standards under the MATS Rule Would Address.

Many of the undersigned Attorneys General and Local Governments have for years worked to reduce the harms that power-plant HAP emissions impose on our residents and natural resources through stringent state-based emissions limits, particularly for mercury.[9] Yet because large amounts of airborne mercury and other HAPs from upwind, out-of-state plants are transported across our borders, state regulation alone has proven insufficient. As a result, we have advocated strenuously for strong federal standards under section 112(d) to curb that cross-border pollution. But while the 2012 MATS Rule has produced substantial reductions nationwide, HAP emissions from many power plants remain unacceptably high and continue to pose risks to our residents—especially those who are particularly susceptible to or highly exposed to those emissions—as well as to our natural resources.

A. The Attorneys General and Local Governments Have Long Advocated for Strong Federal Controls on Power Plant Hazardous Air Pollution.

For more than fifteen years, the Attorneys General and Local Governments have sought strong federal regulation of power-plant HAP emissions. That effort has spanned EPA's 2000 determination that regulation of power plants is "appropriate and necessary" under section 112(n)(1)(A);[10] its 2012 reaffirmation of that determination and issuance of section 112(d) emissions standards;[11] its 2016 supplemental finding supporting that determination on remand from *Michigan v. EPA*, 135 S. Ct. 2699 (2015),[12] and its purported 2020 rescission of that determination.[13] Most recently, many of the Attorneys General and Local Governments commented in support ("2022 States Comments") of EPA's proposal, finalized in February 2023, to revoke the 2020 rescission of its appropriate and necessary determination and yet again reaffirm that determination.[14] We likewise strongly support EPA's proposed reassessment of its 2020 technology review, the proposal on which EPA currently seeks comment. As discussed below, despite significant reductions in power-plant emissions of mercury and other HAPs since 2012, ongoing emissions from coal-fired power plants continue to threaten our most vulnerable residents and to contribute to mercury contamination of our natural resources.

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[9] *See* Comments of the Attorneys General of Massachusetts et al. ("2022 States Comments"), Doc. ID No. EPA-HQ-OAR-2018-0794-4942, at 8-9 (Apr. 11, 2022). The 2022 States Comments are attached hereto as Exhibit 1.

[10] 65 Fed. Reg. 79,825 (Dec. 20, 2000).

[11] 77 Fed. Reg. at 9311, 9366-76.

[12] 81 Fed. Reg. 24,420 (Apr. 25, 2016).

[13] 85 Fed. Reg. at 31,289–90.

[14] 2022 States Comments, *supra* note 9, at 38–40.

B. More Stringent Federal Limits on Emissions from Coal-Fired Power Plants Are Necessary to Protect Our Residents and Natural Resources.

1. Power-Plant HAP Emissions Cause Serious Human Health and Environmental Harms.

Exposure to the HAPs emitted by power plants can cause a wide range of human health harms, including neurological, immunological, reproductive, and genetic injuries, and increased risk of pulmonary and cardiovascular disease, as well as significant environmental harms.[15] As described in greater detail in our 2022 States Comments, the harms caused by power-plant mercury emissions are of special concern to the Attorneys General and Local Governments.[16] Power plants were the largest domestic source of mercury emissions in 2012 when the MATS Rule was promulgated, and they remain so today,[17] contributing to the widespread mercury contamination of our inland and coastal fisheries. Despite the imposition of strict mercury emissions limits for power plants and other sources within our borders, mercury contamination remains ubiquitous in our waterbodies—and waterbodies nationwide—endangering our residents and natural resources and reducing the value of our recreational and commercial fisheries.[18] As a result, states across the Nation have been required to develop numerous "total maximum daily loads" or "TMDLs" to meet Clean Water Act obligations,[19] as well as to institute widespread fish

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[15] David L. MacIntosh et al., Env't Health & Eng'g, Inc., *Emissions of Hazardous Air Pollutants from Coal-Fired Power Plants* 5, tbl.1, 35 (2011), https://www.lung.org/getmedia/25962184-d2fc-42f8-b5a3-8ece3257fbab/emissions-ofhazardous-air.pdf.pdf; Muhammad E. Munawer, *Human Health and Environmental Impacts of Coal Combustion and Post-Combustion Wastes*, 17 J. Sustainable Mining 87, 89, fig. 1, 93, tbl. 1 (2018), https://www.sciencedirect.com/science/article/pii/S2300396017300551; 88 Fed. Reg. at 24,857; 77 Fed. Reg. at 9310; 76 Fed. Reg. 24,976, 24,978, 24,994-95 (May 3, 2011).

[16] 2022 States Comments, *supra* note 9, at 3-4, 5-10.

[17] 88 Fed. Reg. at 24,857; 76 Fed. Reg. at 24,980, 25,002, tbl. 3.

[18] 2022 State Comments, *supra* note 9, at 7-10, 12-13.

[19] In thirteen states—Connecticut, Florida, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, South Dakota, and Vermont—mercury contamination that has become significant enough to require the development of state- or region-wide TMDLs. *See* Conn. Dep't of Env't Prot., Me. Dep't of Env't Prot., Mass. Dep't of Env't Prot., N.H. Dep't of Env't Serv., N.Y. Dep't of Env't Conservation, R.I. Dep't of Env't Mgmt., Vt., Dep't of Env't Conservation, New England Water Pollution Control Comm'n., *Northeast Regional Mercury Total Maximum Daily Load* (2007), https://www.nescaum.org/documents/final-northeast-regional-mercury-tmdl-20071024.pdf; Conn. Dep't of Env't Prot., et al., *Final Northeast Regional Mercury Total Maximum Daily Load Final Addendum for Massachusetts (CN) 377.0)* (2012), https://www.mass.gov/doc/northeast-regional-mercury-total-maximum-daily-load-final-addendum-for-massachusetts-0/download; Fla. Dep't of Env't Prot., *Mercury TMDL for the State of Florida* (2013), https://floridadep.gov/sites /default/files/Mercury-TMDL.pdf; Mich. Dep't of Env't Quality & Env't Prot. Agency, *Michigan Statewide Mercury Total Maximum Daily Load* (2018), https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/SWAS/

consumption advisories to protect public health.[20] Such advisories, however, are often less effective at reducing consumption of contaminated fish by many of our most highly exposed the populations.[21] Indeed, across the Nation, tens of thousands of children are born each year with mercury levels exceeding EPA's reference dose, putting them at risk of permanent neurological damage, and millions of people are at risk of fatal heart attacks and non-fatal heart disease due to exposure to mercury through consumption of contaminated fish.[22]

The huge volumes of toxic acid gases and non-mercury metals—including lead and known carcinogens such as arsenic, chromium, and nickel—emitted by coal-fired power plants are also of great concern to the Attorneys General and Local Governments.[23] Power plants continue to be the largest domestic emissions source of many non-mercury metals, as well as the acid gas HCl.[24] Exposure to many of those non-mercury metals is associated with a wide range of serious health conditions, including adverse neurological, cardiovascular, immunological, reproductive, liver, kidney, and respiratory effects, as well as cancer.[25] And growing evidence demonstrates that exposures to mixtures of those metals can be especially dangerous.[26] Similarly, the serious pulmonary and respiratory harms caused by inhalation of the types of acid gases emitted by coal-fired power plants are also well-documented.[27]

TMDL-Other/statewide-mercury.pdf?rev=cb18141b69ba4e05a4824f3fcda96ce9 ; Minn. Pollution Control Agency, *2020 Revision to the Minnesota Statewide Mercury Total Maximum Daily Load* (2021), (Original 2007 TMDLs Attach. 1), https://attains.epa.gov/attains-public/api/documents/actions/MNPCA/MN_PRJ07770-001_2020/199356; N.J. Dep't of Env't Prot., *Total Maximum Daily Load for Mercury Impairments Based on Concentration in Fish Tissue Caused Mainly by Air Deposition to Address 122 HUC 14s Statewide* (2009), https://www.state.nj.us/dep/wms/bears/docs/TMDL%20HG%20document%20final%20version.pdf; N.C. Dep't of Env't Quality, *North Carolina Mercury TMDL* (2012), https://www.deq.nc.gov/water-quality/planning/bpu/statewide/ncmercurytmdl-epasubmit/download; S.D. Dep't of Env't and Nat. Res., *South Dakota Mercury Total Maximum Daily Load* (2015, Revised 2016), https://danr.sd.gov/Conservation/WatershedProtection/TMDL/docs/TableDocs/tmdl_statewidemercury.pdf; S.D. Dep't of Env't and Nat. Res., *2022 Addendum to the South Dakota Mercury TMDL* (2022), https://danr.sd.gov/Conservation/WatershedProtection/TMDL/docs/TableDocs/tmdl_statewideMercury2022.pdf.

[20] 2022 States Comments, *supra* note 9, at 7-8, 12-13.

[21] *Id.* at 5-6.

[22] *Id* at 4.

[23] *See* 87 Fed. Reg. at 7637, 7640; 2022 NGO Comments, *supra* note 4, Attachment 20, Raina M. Maier et al., National Institute of Environmental Health Sciences Superfund Research Centers at the University of Arizona and University of New Mexico, Prepared for Center for Applied Environmental Law and Policy, *Toxicity Review of Metals Emissions from Coal-Fired Power Plants*, at 20-23 (Mar. 2022).

[24] 88 Fed. Reg. at 24,857.

[25] *Id.* at 24,857, 77 Fed. Reg. at 9310.

[26] *See* Maier et al., *supra* note 24, at 10-11.

[27] Ruben M. L. Colunga Biancatelli *et al.*, *Age-Dependent Chronic Lung Injury and Pulmonary Fibrosis following Single Exposure to Hydrochloric Acid*, 22 Int'l J. Molecular Sci. 8833 (2021);

Further, as EPA recognizes, the health harms from power-plant HAP emissions are experienced disproportionately by certain sensitive populations, such as children, and by highly exposed populations, such as subsistence fishers and individuals living near power plants, who are disproportionately likely to be communities experiencing poverty or communities of color.[28] Thus, populations who consume higher amounts of fish, such as tribal communities and urban fishers experiencing poverty, are at greater risk for methylmercury exposure.[29] Moreover, as EPA has found, tribal communities are also more likely than the average population to reside within 10 km of the lignite-coal-burning plants subject to the MATS Rule, which are responsible for a disproportionately large share of power-plant mercury emissions.[30] In addition, communities of color and low-income populations are at greater risk from power-plant particulate matter (PM) emissions—to which most non-mercury metal HAPs are bound—because those communities are already disproportionately exposed to fine PM ($PM_{2.5}$) from other sources[31] and also experience disproportionate health impacts from that exposure.[32] Similarly,

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Am. Thoracic Soc'y, *An Official American Thoracic Society Workshop Report: Chemical Inhalational Disasters Biology of Lung Injury, Development of Novel Therapeutics, and Medical Preparedness*, 14 Annals Am. Thoracic Soc'y 1060, 1064 (2017); Declaration of Amy B. Rosenstein submitted in support of the Joint Motion of State, Local Government and Public Health Respondent Intervenors for Remand Without Vacatur, *White Stallion v. EPA*, No. 12-1100 (D.C. Cir. Sept. 24, 2015); *See* 77 Fed. Reg. at 9363; 76 Fed. Reg. at 25,016.

[28] 88 Fed. Reg. at 24,892, 24,896; 87 Fed. Reg. at 7646–47; 77 Fed. Reg. at 9347, 9354, 9441; 76 Fed. Reg. at 24,977-78, 25,018; 65 Fed. Reg. at 79,829; EPA, *Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards* 7-26, 7-35 to 7-36, 7-40 to 7-41 (2011), Doc. ID No. EPA–HQ–OAR–2009–0234–20131.

[29] 2022 States Comments, *supra* note 9, at 5-7.

[30] 88 Fed. Reg. at 24,876, 92.

[31] Haley M. Lane, et al., *Historical Redlining Is Associated with Present-Day Air Pollution Disparities in U.S. Cities*, 9 Env't. Sci. & Tech. Letters 345 (2022), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9009174/; Bart D. Ostro, et al., *The Impact of Components of Fine Particulate Matter on Cardiovascular Mortality in Susceptible Subpopulations*, 65 Occup. Env't. Med. 750 (May 2008), https://oem.bmj.com/content/65/11/750. *See also* 88 Fed. Reg. at 24,896 ("EPA believes that $PM_{2.5}$ and ozone exposures that exist prior to this action result in disproportionate and adverse human health or environmental effects on people of color, low-income populations and/or Indigenous peoples.").

[32] Kevin P. Josey, et al., *Air Pollution and Mortality at the Intersection of Race and Social Class*, N. Engl. J. Med. (Mar. 2023), https://www.nejm.org/doi/10.1056/NEJMsa2300523; Jiawen Liu, et al., *Disparities in Air Pollution Exposure in the United States by Race/Ethnicity and Income, 1990–2010*, Env't. Health Perspectives, 129(12) (Dec. 2021), https://doi.org/10.1289/EHP8584; Abdulrahman Jbaily, et al., *Air Pollution Exposure Disparities Across U.S. Population and Income Groups*, 601 Nature 228 (Jan. 2022), https://doi.org/10.1038/s41586-021-04190-y; Timothy W. Collins, et al., *Communities of Color are Disproportionately Exposed to Long-term and Short-term PM2.5 in Metropolitan America*, 214 Env't Research 7 (2022), https://pubmed.ncbi.nlm.nih.gov/35961542/; Ihab Mikati, et al., *Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status*, 108(4) Am. J. Public Health 480 (Apr. 2018),

relative to adults, children face both greater exposure to HAPs—due to their higher respiratory and soil/dust ingestion rates—and greater potential harm from those HAPs—due to their rapidly developing systems and organs and immature detoxification pathways.[33] For these reasons, both airborne lead exposure and mercury exposure in utero and through fish consumption can have lifelong cognitive and detrimental socioeconomic impacts on children,[34] and inhalation of acid gases and PM to which non-mercury HAPs are bound may pose greater respiratory risks to children.[35]

2. Ongoing Power-Plant Emissions Under the Current Standards Continue to Harm Public Health and Natural Resources Within the Jurisdictions of the Attorneys General and Local Governments.

Since its promulgation in 2012, the MATS Rule has achieved, and continues to achieve, massive reductions in emissions of power-plant HAPs. Power-plant mercury emissions are estimated to have declined by 90 percent between 2010 and 2021,[36] while acid gas and non-mercury metal HAP emissions declined by 96 and 81 percent, respectively, between 2010 and 2017.[37] But, even with those substantial emissions reductions, power plants remain the Nation's largest source of HAPs, emitting 3 tons of mercury (in 2021), along with 4,831 tons of acid gases and 221 tons of non-mercury metals (in 2017).[38] Further, some of the Nation's most polluting coal-fired power plants are concentrated geographically, such as the lignite-coal-burning plants in North Dakota and Texas,[39] which increases the cumulative burden of such pollutants on

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5844406/; Christopher W. Tessum, et al., *PM2.5 Polluters Disproportionately and Systemically Affect People of Color in the United States* Sci. Adv. 7 (2021), https://pubmed.ncbi.nlm.nih.gov/33910895/.

[33] 76 Fed. Reg. at 25,018.

[34] Sara T.C. Orenstein et al., *Prenatal Organochlorine and Methylmercury Exposure and Memory and Learning in School-Age Children in Communities Near the New Bedford Harbor Superfund Site, Massachusetts*, 122(11) Env't Health Persp. 1253, 1256, 1257–58 (2014), https://ehp.niehs.nih.gov/doi/10.1289/ehp.1307804; Stephanie Bose-O'Reilly et al., *Mercury Exposure and Children's Health*, 40(8) Current Probs. in Pediatric & Adolescent Health Care 186, 186 (2010), https://doi.org/10.1016/j.cppeds.2010.07.002; Pub. Health & Env't, World Health Org., *Exposure to Mercury: A Major Public Health Concern* 3 (2021), https://www.who.int/publications/i/item/9789240023567; Hans Gronquvist et al., *Understanding How Low Levels of Early Lead Exposure Affect Children's Life Trajectories*, 128 J. Pol. Econ. 3376, 3423-24, 3388 n.16.

[35] 76 Fed. Reg. at 25,018; Colunga Biancatelli, et al., *supra* note 28, at 1-2, 12-13.

[36] *See* EPA, *Progress Report: Emissions Reductions: MATS Emission Trends* (2021), https://www3.epa.gov/airmarkets/progress/reports/emissions_reductions_mats.html#figure1.

[37] 87 Fed. Reg. at 7648; 84 Fed. Reg. 2670, 2689, tbl. 4.38 (Feb. 7, 2019).

[38] 87 Fed. Reg. at 7640, 7672; 84 Fed. Reg. at 2689, tbl. 4.

[39] *See* EPA, *Progress Report: Emissions Reductions: MATS State-by-State* (2021), https://www3.epa.gov/airmarkets/progress/reports/emissions_reductions_mats.html#

surrounding and downwind communities. In neighboring Minnesota, those North Dakota plants also contribute substantially to regional haze issues,[40] as do coal-fired power-plant emissions in other parts of the Nation.[41] In New York City, coal-fired power plants are a significant contributor to the approximately 30 percent of ambient $PM_{2.5}$ that comes from regional sources and that portion of the City's $PM_{2.5}$ load is estimated to contribute to approximately 600 deaths and 1,500 hospital visits and hospitalizations each year.[42]

As a result, power plant emissions continue to create significant public health and environmental harms within the jurisdictions of the Attorneys General and Local Governments and across the Nation. The burden of those ongoing harms falls disproportionately on our most sensitive and highly exposed residents, including communities of color and those experiencing poverty.[43] For example, retirements of coal-fired power plants since 2010 have disproportionately occurred in higher-income communities, leaving lower-income communities more likely to be located within 5 to 15 km of active coal-fired plants.[44] And because such

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figure2 (individual state power plant mercury emissions for 2021 available by selecting 2021 version of map and clicking on individual states in map); Dai, et al., Env't. Sci. & Tech. Letters, *Sociodemographic Disparities in Mercury Exposure from U.S. Coal-Fired Power Plants* at D (2023), https://pubs.acs.org/doi/10.1021/acs.estlett.3c00216?ref=pdf (noting that "[m]ost active plants in 2020 emitted <5 kg of Hg to the atmosphere per year, but the highest emitting plants in North Dakota and Texas emitted >100 kg of Hg.").

[40] Minnesota Pollution Control Agency, *Minnesota's State Implementation Plan for Regional Haze* 31, Tbl. 13, 37, Tbl. 16, 53 (2022), https://www.pca.state.mn.us/sites/default/files/aq-sip2-19.pdf (North Dakota is the most significant out-of-state contributor to visibility impairment in Minnesota, largely due to its power-plant SO_2 and NO_x emissions).

[41] *See* NESCAUM, *supra* note 7, at 19–20.

[42] *See* Masha Pitiranggon, et al., *Long-term trends in local and transported $PM_{2.5}$ pollution in New York City,* 248 Atmospheric Environment, 118238 at 5 (2021) (finding that 23-30 percent of $PM_{2.5}$ in NYC in 2017 was attributable to regional sources and that sulfate was the largest component of that $PM_{2.5}$); Steffania Squizzato, et al., *A long-term source apportionment of $PM_{2.5}$ in New York State during 2005–2016*, 192 Atmospheric Environment 35, 38-39 (2018) (finding that the sulfate fraction of $PM_{2.5}$ in New York is highly correlated with variations in selenium which supports its association with coal-fired powerplants); New York City Dep't of Health, *Health Impacts of Air Pollution: Asthma Emergency Departments Visits due to Ozone*, Env't & Health Data Portal (2017) (showing a total of 5191 annual hospital visits and hospitalizations and a total of 1971 annual deaths attributable to $PM_{2.5}$ exposure), https://a816-dohbesp.nyc.gov/IndicatorPublic/beta/data-explorer/health-impacts-of-air-pollution/; Vincent Dutkiewicz, et al., *Elemental composition of $PM_{2.5}$ aerosols in Queens, New York: Evaluation of sources of fine-particle mass*, 40 Atmospheric Environment 347, 351, 355, 357-58 (2006) (finding selenium to be associated with transported coal emissions in northeastern U.S.).

[43] *See* Part I.B.1 *supra*.

[44] Dai, et al., *supra* note 40, at 10.

communities often face cumulative burdens from other sources' emissions of the same pollutants, even small contributions from coal-fired power plants are significant.[45]

In the Great Lakes Region, for example, tribal subsistence fishers—who are estimated to have three to ten times greater methylmercury exposure than the general population—face disproportionate risks from power-plant mercury emissions under the current Standards.[46] In Minnesota, many tribal communities are located downwind of the highly polluting lignite-coal-fired power plants in neighboring North Dakota, which ranked second in the Nation for power-plant mercury emissions in 2021.[47] Indeed, recent analysis shows that nearly two-thirds of sampled fish in North Dakota contained power-plant attributable methylmercury at concentrations capable of causing an exceedance of EPA's reference dose.[48] The same study found that more than half the fish sampled in the Southcentral U.S., where Texas coal-fired plants led the Nation in mercury emissions in 2021, similarly contained levels of power-plant attributable methylmercury sufficient to cause reference dose ("RfD") exceedances.[49]

Further, tribal communities in Minnesota are exposed to mercury emissions not only from those upwind power plants but also from the taconite iron ore processing industry, which contributes approximately half of Minnesota's in-state mercury inventory.[50] Due to the

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[45] 2022 States Comments, *supra* note 9, at 34-36; *see* 87 Fed. Reg. at 7646-7647; 88 Fed. Reg. 13,956, 13,973-74 (Mar. 6, 2023).

[46] *See* 2022 States Comments, *supra* note 9, at 5; 87 Fed. Reg. at 7647; EPA, *National-Scale Mercury Risk Estimates for Cardiovascular and Neurodevelopmental Outcomes for the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units* ("2021 TSD") 20-22, tbl. 3 (Sept. 2, 2021), Doc. ID No. EPA-HQ-OAR-2018-0794-4605, (noting that Great Lakes Tribes likely face disproportionately high risks of fatal heart attacks from power-plant methylmercury).

[47] *See* EPA, *Progress Report: Emissions Reductions: MATS State-by-State* (2021), https://www3.epa.gov/airmarkets/progress/reports/emissions_reductions_mats.html #figure2 (individual state power plant mercury emissions for 2021 available by selecting 2021 version of map and clicking on individual states in map; North Dakota's plants emitted 838 lbs. of mercury in 2021, more than 40 percent of the Nation's total); *see also* Adam Willis, *US Coal Plants Slashed Their Mercury Pollution. North Dakota Accounts for a Big Share of What Remains*, InForum (Mar. 4, 2022), https://www.inforum.com/news/north-dakota/us-coal-plants-slashed-their-mercury-pollution-north-dakota-accounts-for-a-big-share-of-what-remains?utm_ source=ourcommunity now&utm_medium=web.

[48] Dai, et al., *supra* note 40, at 12.

[49] *Id.*

[50] 2022 States Comments, *supra* note 9, at 35; Minnesota Pollution Control Agency, *Statewide Mercury TMDL Emissions Inventory* (2021), https://www.pca.state.mn.us/sites/default/files/wq-iw4-02i8.pdf (specifying draft 2019 mercury emissions of 676.3 pounds for "Ferrous Mining/Processing," out of 1395 pounds for all state sources). EPA has historically failed to set a mercury limit for the taconite ore processing industry despite Federal Clean Air Act requirements to do so by the year 2000 (85 Fed. Reg. 45476, 45,485 (Sep. 15, 2019)), and that failure is the subject of separate litigation that is currently stayed before the D.C. Circuit Court of Appeals. *Minnesota, et al. v. Wheeler*, D.C. Cir. No. 20-1392. EPA now proposes to set

cumulative effects of such mercury sources, waterbodies within those tribal areas are highly contaminated by methylmercury and ten percent of infants born in Minnesota's Lake Superior Basin—which includes several environmental justice communities—have blood mercury levels exceeding EPA's reference dose.[51] Similar cumulative exposure risks are of concern in the Southwest where tribal communities are exposed to non-mercury metals from coal-fired power plant emissions as well as from abandoned mining sources.[52]

And in the Southeast, EPA's 2021 watershed-based risk assessment indicates that under the current standards low-income Black subsistence fishers face elevated risks of fatal heart attacks from power-plant methylmercury exposures.[53] Consistent with that finding, recent demographic analysis of the communities surrounding several coal-fired power plants in North Carolina, South Carolina, and Alabama shows that, relative to each state's overall population, a disproportionate number of Black people, as well as people of color and people with low incomes, live within 5 km of the plants.[54] Further, air dispersion modeling shows that due to that proximity such individuals are exposed to the maximum impact of mercury emissions from those facilities.[55] For the same reason, those populations are also disproportionately exposed to power-plant emissions of sulfur dioxide (SO_2), the surrogate measure for power-plant acid gas emissions, and filterable PM (fPM), to which most power-plant non-mercury metals HAPs are bound,[56] which is particularly concerning given the greater cumulative exposure to $PM_{2.5}$ such populations systematically experience from other pollution sources.[57]

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Stronger standards under the MATS Rule are essential to addressing these serious ongoing harms, and, as discussed next, they are warranted under section 112(d)(6) by evidence

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mercury MACT standards for new and existing taconite indurating furnaces, pursuant to sections 112(d)(2) and (3). 88 Fed. Reg. 30,923 (May 15, 2023). EPA expects that where additional controls are needed the taconite ore processing industry will use activated carbon injection ("ACI") with high efficiency venturi scrubbers, and that the standards will generate an estimated reduction of 462 pounds of mercury per year at a cost of $129 million in retrofits and annual costs of $71 million per year. *Id.*

[51] 2022 States Comments, *supra* note 9, at 35.

[52] Maier et al., *supra* note 24, at 26-27.

[53] 87 Fed. Reg. at 7647; EPA, *National-Scale Mercury Risk Estimates for Cardiovascular and Neurodevelopmental Outcomes for the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units* 20-22, tbl. 3 (Sept. 2, 2021), Doc. ID No. EPA-HQ-OAR-2018-0794-4605.

[54] Comments of the Southern Environmental Law Center on Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding, Docket No. EPA-HQ-OAR-2018-0794, at 8-9 (Apr. 11, 2022).

[55] *Id.* at Exh. C, Dr. Ranajit Sahu, Technical Analysis in Support of SELC's Comments on EPA's Proposed Reaffirmation of the MATS Appropriate and Necessary Finding (Apr. 11, 2022) ("2023 Sahu Technical Analysis") at 2-6.

[56] *Id* at 2-6.

[57] *See id.*

that existing control technologies have proven more effective and less costly than EPA anticipated in 2011.

II. It Is Necessary Under Section 112(d)(6) for EPA to Adopt More Stringent Limits on Coal-Fired Power Plant Emissions of HAPs.

EPA has determined that improvements in both the effectiveness and the affordability of the technologies used to control HAP emissions from coal-fired power plants warrant strengthening the mercury standard for lignite-coal-fired units and the non-mercury metal fPM surrogate standard for all existing coal-fired units, as well as revising that fPM standard to require monitoring through PM continuous emission monitoring systems ("CEMS").[58] The Attorneys General and Local Governments agree that those revisions to the Standards are "necessary" pursuant to EPA's section 112(d)(6) technology review. We urge EPA to go further, however, by lowering the mercury limit for nonlignite-coal-fired units to a level comparable to the more stringent state-based standards that units within many of our borders have been meeting for years. State experience with implementing such standards has shown that coal-fired units can comply with significantly lower mercury standards using the same, readily available and affordable control technologies that have been employed nationwide since the MATS Rule went into effect.

A. EPA Is Justified in Reconsidering Its 2020 Technology Review[59] and Has the Discretion to Evaluate a Range of Relevant Factors in Doing So.

Under section 112(d)(6), at least every eight years EPA must "review, and revise as necessary" the technology-based standards established under section 112, including by "taking into account developments in practices, processes, and control technologies" since the standards were developed.[60] This "review ensures that, over time, EPA maintains source standards compliant with the law and on pace with emerging developments that create opportunities to do even better."[61] The terms "revise as necessary" and "developments" are both interpreted broadly, with reference to section 112(d)(2)'s focus on the "maximum" emissions reductions that are "achievable."[62] Thus, "developments" include "not only wholly new methods, but also

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[58] 88 Fed. Reg. at 24,867-72.
[59] As EPA correctly states, the section 112(d)(6) requirement to review and revise the Standards based on developments in practices, processes, and technologies is independent of the section 112(f)(2) requirement to identify and address through health-based standards certain residual risks remaining despite the implementation of the Standards. 88 Fed. Reg. at 24,866 & n.17. Thus, EPA's decision not to revise its 2020 finding that more stringent standards are not required under section 112(f)(2)'s specific statutory thresholds has no bearing on its separate obligation to determine whether further emissions reductions are achievable under section 112(d)(6).
[60] 42 U.S.C. § 7412(d)(6).
[61] *Louisiana Env't Action Network v. EPA*, 955 F.3d 1088, 1093 (D.C. Cir. 2020) ("*LEAN*").
[62] *Id.* at 1097-98 ("revise as necessary" not limited to consideration of listed factors); *Nat'l Ass'n for Surface Finishing v. EPA*, 795 F.3d 1, 11 (D.C. Cir. 2015) ("developments" not limited to

technological improvements … that could result in significant additional emission reduction,"[63] and EPA may consider factors beyond the kinds of "practical and technological advances" specifically listed in section 112(d)(6).[64]

Here, EPA's 2020 technology review did little more than describe the technologies being used to control emissions under the Standards.[65] As EPA observes, that review failed to evaluate whether there had been any developments in the cost of those control technologies or in their effectiveness, such as by considering the current performance of those controls.[66] Accordingly, we agree that it is appropriate for EPA to reconsider its 2020 technology review.[67]

Further, we agree that EPA has the discretion to consider a range of factors in completing a section 112(d)(6) review,[68] including, of particular relevance here, the substantially lower emissions rates currently being achieved by most units[69] and the compliance costs that will be incurred by currently under-performing units.[70]

With regard to costs, as EPA notes, it has used a variety of metrics—including "cost-effectiveness, the total capital costs of proposed measures, annual costs, and costs compared to total revenues"—when completing technology reviews, and EPA seeks comment on how it should consider costs in the context of the MATS Rule.[71] The Attorneys General and Local Governments believe that it is appropriate to consider compliance costs in the context of the revenues, capital expenditures, and total expenditures (capital and production) of the power

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"wholly new" developments); *Ass'n of Battery Recyclers, Inc. v. EPA*, 716 F.3d 667, 673-74 (D.C. Cir. 2013) (consideration of costs as part of section 112(d)(6) technology review permissible given that section 112(d)(2) "expressly authorizes cost consideration in other aspects of the standard-setting process").

[63] *Nat'l Ass'n for Surface Finishing*, 795 F.3d at 11 (internal quotations omitted).

[64] *LEAN*, 955 F.3d at 1098.

[65] *See* 84 Fed. Reg. at 2700; EPA, *Technology Review for the Coal- and Oil-fired EGU Source Category* ("2020 RTR Memorandum"), Doc. ID No. EPA-HQ-OAR-2018-0794-0015, at 4-10 (Jul. 2018).

[66] 88 Fed. Reg. at 24,865, 24,867; *see* 84 Fed. Reg. at 2700; 2020 RTR Memorandum at 4-10.

[67] As EPA notes, its reconsideration is of the 2020 technology review is consistent with its inherent authority to reconsider previous decisions "to the extent permitted by law and supported by a reasoned explanation." 88 Fed. Reg. at 24,859 (citing *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009) and *Motor Vehicle Mfrs. Ass'n v. State Farm Mutual Auto. Ins. Co.*, 463 U.S. 29, 42 (1983)). And, notably, here, EPA is permitted under section 112(d)(6) to reassess such standards more frequently than every 8 years. *See Portland Cement Ass'n v. EPA*, 665 F.3d 177, 189 (D.C. Cir. 2011).

[68] 88 Fed. Reg. at 24,863-64.

[69] *See, e.g.*, National Emissions Standards for Hazardous Air Pollutants: Ferroalloys Production, 80 Fed. Reg. 37,366, 37,380 (June 30, 2015) ("Ferroalloys Production RTR") (considering the fact that emissions were "far below" the existing surrogate PM standard for metal HAPs in evaluating whether improvements in PM controls had occurred).

[70] *See Ass'n of Battery Recyclers*, 716 F.3d at 673-74.

[71] 88 Fed. Reg. at 24,870.

sector as a whole.[72] As noted above, the determination of whether it is "necessary" to revise standards under section 112(d)(6) must be made with reference to the section 112(d)(2) mandate to impose the "maximum" emissions reductions "achievable" for the sources in the category at issue.[73] Imposing a standard that will achieve "maximum" achievable reductions certainly does not suggest that the chosen standard must provide the lowest annual cost or the lowest cost per ton of pollutant removed. It also does not suggest that EPA lacks the discretion to evaluate the impact that compliance may have on the industry as whole. And, here, where it is clear that the vast majority of units are achieving emissions rates well below the current standards—having long since absorbed the compliance costs of the control technologies that a minority of under-performing units should now employ—it is reasonable to evaluate those costs in the context of the industry's total revenues or capital expenditures.

B. The Attorneys General and Local Governments Support EPA's Proposal to Adopt an Emissions Limit of 1.2 lb/TBtu for Lignite Units and Urge EPA to Adopt a More Stringent Limit of At Least 0.65 lb/TBtu for Nonlignite Units.

The Attorneys General and Local Governments observe that compliance cost projections are often overblown at the time regulations are set and that the MATS Rule in particular has resulted in compliance costs far below initial projections. Given that experience and the evidence that most units are emitting well below the current Standards, more stringent mercury emissions standards are "necessary" for all coal-fired power plants under section 112(d)(6). Accordingly, we support EPA's proposal to adopt a more stringent standard of 1.2 lb/TBtu for lignite plants. But we also urge EPA to adopt an even more stringent standard for nonlignite plants because such a wide subset of those units have demonstrated the capability to easily comply with an emissions rate of 0.65 lb/TBtu, or lower.

1. State Experience Regulating Power Plants Demonstrates that More Stringent Mercury Emissions Limits Are Necessary Under Section 112(d)(6) Because They Are Achievable and Affordable.

The experience in the jurisdictions of the Attorneys General and Local Governments confirms that stringent limits on power-plant mercury emissions can be readily achieved at lower-than-predicted costs and thus should be adopted nationally through section 112(d)(6). To address widespread mercury contamination of state waterbodies,[74] at least fourteen states have for years enforced state-based limits on power-plant mercury emissions,[75] and nearly every one

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[72] *See id.*
[73] *See* 42 U.S.C. § 7412(d)(2).
[74] *See* Part I.A.2 *supra.*
[75] *See* 5 Colo. Code Regs. § 1001-8:B.VIII (first phase compliance by Jan. 1, 2012); Del. Admin. Code tit. 7 § 1146-6 (first phase compliance by Jan. 1, 2009); Conn. Gen. Stat. § 22a-199 (compliance by July 1, 2008); Ill. Admin. Code tit. 35 § 225.230 (compliance by July 1, 2009); Md. Code Regs. tit. 26, § 11.27.03.D (first phase compliance by Jan. 1, 2010); 310 Mass. Code Regs. § 7.29 (first phase compliance by Jan. 1, 2008); N.J. Admin. Code § 7:27-27.7

of those states has imposed a more stringent emissions limit than the Standards.[76] These lower emissions limits have driven significant and meaningful mercury emissions reductions, which have proven to be both achievable and cost-effective.

As detailed in the 2022 States Comments, coal-fired units have capably complied with the existing Standards, and have done so at significantly lower cost than EPA initially projected.[77] This is due in part to improvements and cost reductions in pollution controls, including the activated carbon injection ("ACI") technology used to control mercury.[78] Similarly, coal-fired power plants have been able to achieve state-law emissions limits at reasonable cost, even where they are more stringent than the current Standards.[79]

Further, recent analysis demonstrates that the cost of compliance continues to decline relative to EPA's 2012 projections, even using conservative assumptions.[80] And EPA acknowledges that its approach in the Proposal is a conservative one that is likely to overestimate compliance costs for lignite coal units.[81] As both EPA's assessment and other recent analysis

(compliance by Dec. 15, 2007); Minn. R. 7011.0561 (first phase compliance by Jan. 1, 2018); Mont. Admin. R. 17.8.771 (compliance by Jan. 1, 2010); N.H. Rev. Stat. Ann. § 125-O:11-18 (compliance by July 1, 2013); N.Y. Comp. Codes R. & Regs. tit. 6 § 246.6 (first phase compliance by Jan. 1, 2010); Or. Admin. R. 340-228-0606 (compliance by July 1, 2012); Wis. Admin. Code NR § 446.13 (compliance by Apr. 16, 2016); *see also* Mich. Admin. Code r. 336.2503(1)(a)-(b) (2009) (compliance by Apr. 16, 2015), modified by Mich. Admin. Code r. 336.2502a (2013) (exempting covered power plants "for which [MATS] is an applicable requirement relative to emissions of mercury" and, if the Rule ceases to be an applicable requirement, extending compliance date to the later of three months from the date of inapplicability or April 16, 2015).

[76] The current Standards require an emissions limit of 1.2 lb/TBtu or 0.013 lb/GW-hr. *See* 77 Fed. Reg. at 9367 tbl.3. Most state rate-based standards are set at 0.6 lb/TBtu or 0.008 lb/GW-hr. *See* Conn. Gen. Stat. § 22a-199(b)(1) (0.6 lb/TBtu); Del. Admin. Code tit. 7 § 1146–6.2 (0.6 lb/TBtu); Ill. Admin. Code tit. 35 § 225.230(a)(1)(A) (0.008 lb/GW-hr); 310 Mass. Code Regs. § 7.29(5)(a)(3)(f) (0.0025 lb/GW-hr); Mich. Admin. Code r. 336.2503(1)(b) (0.008 lb/GW-hr); Minn. R. 7011.0561 (0.008 lb/GW-hr); Mont. Admin. R. 17.8.771(1)(b)(ii) (0.9 lb/TBtu); N.J. Admin. Code § 7:27-27.7(a) (3.00 mg/MWh (equivalent to 0.66 lb/TBtu)); N.Y. Comp. Codes R. & Regs. tit. 6 § 246.6(a) (0.6 lb/TBtu); Or. Admin. R. 340-228-0606(1) (0.6 lb/TBtu); Wis. Admin. Code NR § 446.13(1) (0.008 lb/GW-hr).

[77] 2022 States Comments, *supra* note 9, at 33, 40 (*citing* NESCAUM, *supra* note 7, at 11).

[78] NESCAUM, *supra* note 7, at 11.

[79] *See* note 8, *supra*.

[80] Andover Technology Partners, Prepared for Center for Applied Environmental Law and Policy, *Assessment of Potential Revisions to the Mercury and Air Toxics Standards* (June 15, 2023) ("2023 ATP Assessment") at 32 ("Today there is far more data available on non-lignite units to evaluate the cost of complying with a lower Hg emission level than there was when EPA evaluated the cost of complying with the emission levels of the 2012 MATS regulation.") & Figs. 15-18, https://www.andovertechnology.com/wp-content/uploads/2023/06/C_23_CAELP_Final.pdf.

[81] 88 Fed. Reg. at 24,881.

demonstrate, proven, cost-effective controls include increased usage of ACI and baghouses (or fabric filters), along with other HAP and PM controls including, dry flue-gas desulfurization systems ("FGD") (also known as dry scrubbers), wet scrubbers, and electrostatic precipitators ("ESP"), which provide co-benefit reductions in mercury emissions.[82]

The Attorneys General and Local Governments appreciate EPA's recognition of this record of successful power-plant mercury emissions reductions, which demonstrates the effectiveness and affordability of various mercury-control technologies.[83] Given that real-world experience, the next two subsections detail the Attorneys General and Local Governments' support for EPA's proposal of a 1.2 lb/TBtu mercury emissions limit for lignite coal-fired units and urge EPA to adopt a more stringent mercury emissions limit for nonlignite units of at least 0.65 lb/TBtu.

2. EPA's Proposal to Set a Mercury Emissions Limit of 1.2 lb/TBtu for Lignite Units Is Well-Supported by the Successful Performance of Nonlignite Units Under the Current Standards.

The State and Local Governments support EPA's proposed 1.2 lb/TBtu mercury emissions limit for lignite coal-fired units, which represents a starting point that can and should be revisited and strengthened as new compliance data becomes available. The proposed limit is the same mercury emissions limit that nonlignite-fired units already meet—and that many of those units regularly exceed.[84] Applying the experience of nonlignite units, EPA correctly observes that available controls and methods of operation, especially ACI systems, will allow lignite-fired units to meet the same mercury standard that is being met by units firing on non-lignite coal supply and that the costs of doing so are reasonable.[85] EPA appropriately relies on the beyond-the-floor costs from the 2012 MATS Final Rule, the injection rates reported in the section 114 survey results, and the calculated cost-effectiveness of using ACI controls.[86] EPA has also used a conservative method of determining the cost of injecting nonbrominated ACI, and, further, correctly recognizes that even with differences (and similarities) in feedstocks, lignite-fired units simply are not yet deploying *any* of the most effective control technologies that are already in use and proven at nonlignite-fired power plants.[87] And, as EPA notes, the projected cost of the revised lignite mercury standard, $8,703 per lb of mercury removed, is significantly lower than the cost it has previously found acceptable—both in calculating the existing mercury Standards and in other rulemakings.[88]

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[82] 2023 ATP Assessment, *supra* note 82 at 30-33.
[83] 88 Fed. Reg. at 24,879, 24,881.
[84] 88 Fed. Reg. at 24,880-82.
[85] *See id*. at 24,880-81.
[86] *See id*. at 24,881.
[87] *See id*.
[88] *Id.* (citing a cost of approximately $27,000 per pound of mercury as part of the beyond-the-floor analysis supporting the 2012 MATS Rule and a cost of $27,500 per pound of mercury in the Primary Copper residual risk and technology review).

Given the experience of many of the Attorneys General and Local Government's jurisdictions in implementing more stringent mercury standards and EPA's robust analysis in the Proposal, its determination that it is "necessary" under section 112(d)(6) to reduce the emissions limit for lignite-fired units to 1.2 lb/TBtu is well-supported—especially since proven, cost-effective technology is so readily available. Further, because that emissions limit is the existing standard for nonlignite sources, EPA correctly applies the known cost-effectiveness and usability of ACI and other technologies in nonlignite units to inform its decision to propose the same standard for lignite units.[89] While the Attorneys General and Local Governments support EPA's adoption of the proposed 1.2 lb/TBtu limit, we would also support further mercury emissions reductions by lignite units below that limit and encourage EPA to collect information on those units' compliance with the proposed limit in order to support possible future strengthening of the standard.

3. The Attorneys General and Local Governments Urge EPA to Adopt a Mercury Emissions Limit of At Least 0.65 lb/TBtu for Nonlignite Coal-Fired Units.

The Attorneys General and Local Governments applaud the gains that the existing 1.2 lb/TBtu standard for nonlignite-fired power plants has provided and appreciate the benefits that such an emissions limit will continue to provide moving forward. Even so, we urge EPA to adopt an even more stringent standard similar to the lower emissions limits that many states have been implementing for years.[90] That state experience demonstrates that lower emissions limits—in particular 0.6 lb/TBtu—are being met using proven and affordable control technologies. Indeed, data from units consuming not-low-rank coal (i.e., nonlignite) shows that fully 80 percent of all such units are capable of achieving 90 percent mercury emissions capture or better and emissions rates of 0.65 lb/TBtu or less.[91] If 80 percent of such units are capable of achieving—and indeed exceeding—0.65 lb/TBtu, it is plainly a technologically feasible standard. Further, we recognize EPA's concern about assessing the costs of meeting such a lower mercury standard without having collected section 114 data on the type and injection rates of sorbents and chemical additives.[92] Nonetheless, EPA should be able to evaluate those costs using other available data sources.[93] The Attorneys General and Local Governments thus urge EPA to adopt a more stringent standard for nonlignite units of at least 0.65 lb/TBtu pursuant to its section 112(d)(6) review.

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[89] *See id.* at 24,880-81.
[90] *See* Part II.B.1 & note 77, *supra.*
[91] 2023 ATP Assessment, *supra* note 82, at 33 & fig. 13.
[92] *See* 88 Fed. Reg. at 24,879.
[93] *See* 2023 ATP Assessment, *supra* note 82, at 31-39.

C. The Attorneys General and Local Governments Support Revision of the fPM Standard for Non-Mercury Metals by Lowering That Standard and Requiring Compliance Using PM CEMS.

The Attorneys General and Local Governments support lowering the surrogate fPM standard for non-mercury metal HAPs to at least the 0.010 lb/MMBtu level proposed by EPA, which is currently already achievable by almost all units. But we also urge EPA to go further to adopt a standard as low as the more stringent 0.0060 lb/MMBtu level that it also evaluated and on which it seeks comment, given that a majority of units are already capable of meeting it and that EPA's projected compliance costs for that standard are likely significantly overestimated. Finally, we support requiring all units to use PM CEMS to demonstrate compliance with whichever limit EPA adopts given that use of such continuous monitoring will provide emissions reduction benefits and that concerns about the feasibility of its use at low fPM levels are overblown.

1. More Stringent Limits on the Emission of Non-Mercury Metals from Coal-Fired Power Plants Through a Lower fPM Standard Are Warranted Under Section 112(d)(6).

The Attorneys General and Local Governments agree with EPA that it is "necessary" to lower the fPM limit for all units pursuant to section 112(d)(6).[94] As EPA notes, "the vast majority of existing coal-fired EGUs are performing well below" the 2012 fPM requirement of 0.030 lb/MMBtu using readily available control technologies.[95] That finding is consistent with the experience in our jurisdictions where coal-fired plants are employing electrostatic precipitators and/or fabric filters to meet that current standard. Moreover, as EPA recognizes,[96] and as many parties, including the Attorneys General and Local Governments, have consistently pointed out for years,[97] the costs of generating those lower emissions have been significantly less than anticipated by EPA in 2011, due in large part to operational and monitoring improvements that reduced the need to install or upgrade controls.[98] A revision to the fPM standard is thus "necessary" under section 112(d)(6) to reflect the lower emissions rates that are currently being achieved by most units with existing controls.

Further, the 0.010 lb/MMBtu limit that EPA has proposed is "achievable" using those proven technologies and at reasonable cost, and the Attorneys General and Local Governments support lowering the fPM standard to that level, at a minimum. EPA's analysis indicates that

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[94] 88 Fed. Reg. at 24,869.
[95] *Id.* at 24,871, 24,868.
[96] *Id.* at 24,868-70.
[97] *See, e.g.*, 2022 States Comments *supra* note 9, at 33; Comments of the Attorneys General of Massachusetts, et al., Docket No. EPA-HQ-OAR-2009-0234-20551, at 8 (Jan. 15, 2016).
[98] *See* Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants (Aug. 19, 2021), https://www.andovertechnology.com/wp-content/uploads /2021/08/PM-and-Hg-Controls_CAELP_20210819.pdf; NESCAUM, *supra* note 7, at 11.

91 percent of units can already meet this limit and that, at most, 20[99] of the 275-unit[100] fleet may be required to make upgrades to comply.[101] It is thus not surprising that EPA's projected annual compliance costs will be miniscule within the context of the power sector as a whole—equivalent, for example, to only 0.2 percent of 2019 total retail electricity sales (the lowest sales figure since 2000).[102] And it is notable that, considering the "cost-effectiveness" of the 0.010 lb/MMBtu limit, the upper limit of the projected annual costs here, $44,900 per ton of fPM and $86,000 per ton of $PM_{2.5}$,[103] are substantially lower than the per-ton costs that EPA has considered to be cost-effective in other technology reviews.[104] Thus, EPA should strengthen the standard to *at least* 0.010 lb/MMBtu.

EPA also evaluates and seeks comment on a more stringent fPM limit of 0.0060 lb/MMBtu, which it notes was the average emissions rate for units in 2010, prior to the implementation of the MATS Rule.[105] Currently, 72 percent of existing coal-fired capacity has demonstrated an emissions rate at that level or lower,[106] and a recent analysis shows that 50 percent of units emit below that rate on average annually.[107] Thus, as with the 0.010 lb/MMBtu limit, there is no doubt that meeting that lower emissions rate is technologically feasible using currently available controls and the Attorneys General and Local Governments urge EPA to adopt the 0.0060 lb/MMBtu limit.

EPA has raised concerns about the 0.0060 lb/MMBtu limit citing "potential costs, including the EPA's current assessment of measurement uncertainty, when considering the current fleet."[108] In particular, EPA projects that 65 units would need to install new or upgrade existing fabric filters, the most costly of the possible control upgrades.[109] But there is good reason to believe that this projection is too high. Recent independent analysis shows that only 11 units would likely require new fabric filters because most units would be able to comply with the

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[99] This number, however, is likely an overestimate given that many units may be able to comply by using existing controls. *See* 2023 ATP Assessment*, supra* note 82, at 41, 44, tbl. 7.
[100] EPA, *2023 Technology Review for the Coal- and Oil-Fired EGU Source Category*, EPA–HQ–OAR–2018–0794–5789, at App. B, C (Jan. 2023) ("2023 Technology Review Memo") (listing number facilities and units, respectively, subject to the MATS Rule and for which EPA has fPM compliance data).
[101] 88 Fed. Reg. at 24,868.
[102] *Id.* at 24,870 & tbl. 3.
[103] *See* 2023 Technology Review Memo, *supra* note 103, at 12, tbl. 7.
[104] *See* Ferroalloys Production RTR, *supra* note 70, at 37,381 ($165,000 per ton $PM_{2.5}$); National Emissions Standards for Hazardous Air Pollutants: Secondary Lead Smelting, 76 Fed. Reg. 24,976, 29,060 (May 19, 2011) (proposed rule) ($100,000 per ton of fPM). It is important to note that because these per-ton costs from pre-2019 rulemakings are not adjusted for inflation, they provide a conservatively low estimate of compliance costs relative to the 2019 costs in the Proposal.
[105] 88 Fed. Reg. at 24,868.
[106] 88 Fed. Reg. at 24,686.
[107] 2023 ATP Assessment, *supra* note 82, at 40, tbl. 6.
[108] 88 Fed. Reg. at 24,871.
[109] *Id.* at 24,869.

limit using existing or upgraded ESPs.[110] Indeed, as EPA correctly observes, historically units have been able to achieve lower fPM levels through operational and monitoring changes to existing controls alone.[111] And because EPA's projections do not account for future (but currently unannounced) retirements likely to result from factors unrelated to the MATS Rule, such as the Inflation Reduction Act, they also may overestimate the number of units that would be subject to the more stringent fPM limit.[112]

Further, even assuming EPA's projections are correct, the total annual cost of complying with the 0.0060 lb/MMBtu standard, which EPA estimates to be $633 million annually,[113] is also miniscule in the context of the power sector as a whole, constituting only about 0.31 percent of power sector total expenditures in 2019 ($200.7 billion)[114] or about 0.15 percent of 2019 revenues ($401.7 billion),[115] and thus clearly absorbable by that sector. Even considering the "cost-effectiveness" of that lower rate, the annual costs, $103,000 per ton of fPM and $209,000 per ton of $PM_{2.5}$,[116] are similar to the per-ton costs that EPA has considered to be cost-effective in other technology reviews.[117]

Finally, EPA cites concerns about the cost and feasibility of using PM CEMS to monitor compliance at lower fPM emissions rates, such as a 0.0060 lb/MMBtu.[118] As discussed below, the Attorneys General and Local Governments strongly support the use of PM CEMS to demonstrate compliance. While we agree that it would not be appropriate to set an emissions limit that cannot feasibly be monitored by PM CEMS, it does not appear that EPA's concerns about the use of PM CEMS at low fPM emissions rates are so substantial as to militate against adoption of a 0.0060 lb/MMBtu standard.

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[110] 2023 ATP Assessment, *supra* note 82, at 2, 19-25.
[111] 88 Fed. Reg. at 24,870.
[112] *Id.* at 24,871-72.
[113] *Id.* at 24,870.
[114] *See* EPA, *Supplemental Data and Analysis for the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units – Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding; Notice of Proposed Rulemaking* 81, tbls. A-4, A-6 (Sept. 21, 2022), Doc. ID. No. EPA-HQ-OAR- EPA–HQ–OAR–2018–0794– 4632. The 0.31 percentage is a conservative measure of the relative contribution of the $633 million in annual compliance costs to total industry expenditures because the projected $200.7 billion amount reflects 2007 dollars and has not been adjusted for inflation.
[115] *See* U.S. Energy Info. Admin., *Electric Power Annual 2021*, tbl. 2.3 (Nov. 2022), https://www.eia.gov/electricity/annual/ (showing total revenue from sales of electricity to ultimate customers of $401.738 billion in 2019).
[116] *See* 2023 Technology Review Memo, *supra* note 103, at 12, tbl. 7.
[117] *See* note 107, *supra*.
[118] 88 Fed. Reg. at 24,871.

3. Revision of the fPM Standard to Require the Use of PM CEMS to Demonstrate Compliance Is Necessary as Part of EPA's Section 112(d)(6) Technology Review.

EPA is well justified in revising the Standards to require the use of PM CEMS to demonstrate compliance. That monitoring technology is already employed by a third of coal-fired units to demonstrate compliance with the fPM surrogate standard—providing a clear indication that use of PM CEMS is "achievable" in this context both in terms of cost and availability.[119] When it promulgated the MATS Rule in 2012, EPA estimated that the use of PM CEMS would be more cost-effective than the alterative quarterly stack testing method and it continues to be so.[120] Moreover, both the costs of installing and of operating PM CEMS have declined significantly since then.[121] And, as EPA recognizes, the use of such systems offers many advantages over the quarterly stack testing alternative, in particular continuous and real-time data on fPM emissions, which allow for immediate detection and correction of exceedances and, consequently, reductions in fPM emissions.[122] Further, we agree with EPA that the ability to prevent such non-compliance is especially valuable to communities living in close proximity to coal-fired units,[123] which disproportionately include communities of color and those experiencing poverty as well as cumulative harms from other sources of pollutants.[124] For all of these reasons, the Attorneys General and Local Governments agree with EPA that it is "necessary" under section 112(d)(6) to require all units to demonstrate fPM compliance through the use of PM CEMS.

In the Proposal, EPA also seeks comment on whether it is feasible to use PM CEMS to demonstrate compliance with lower fPM limits, such as the 0.0060 lb/MMBtu level that a majority of units are currently meeting.[125] As explained by EPA, whether such systems are *capable* of accurately measuring fPM at such low levels is not the issue;[126] rather EPA raises concern about the practicality and potential higher costs of using PM CEMS to monitor lower emissions levels in light of the longer collection periods required to calibrate such systems to address the measurement uncertainty inherent at low levels.[127]

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[119] *See id*. at 24,857.
[120] *Id.* at 24,872.
[121] *Id*.
[122] *Id. See also* 2023 Sahu Technical Analysis, *supra* note 56, at 9 (Stack tests "are not representative of normal everyday operation" of regulated units or their PM control devices because "[p]reventive maintenance is paramount to ensure proper operation of these control devices[,]" and such "maintenance is often conducted just prior to a [stack] compliance test" rather than on an ongoing basis, which "adversely and dramatically affects the efficiencies of these controls.").
[123] 88 Fed. Reg. at 24,872.
[124] *See* Part I.B *supra*.
[125] 88 Fed. Reg. at 24,874.
[126] In this regard, it is not accurate to suggest, as the Proposal does elsewhere, that some PM CEMS would "struggle" to meet EPA's average random error requirements at low fPM levels. 88 Fed. Reg. at 24,871.
[127] *See id.* at 24,874.

It is notable, however, that numerous units are already using CEMS to report levels at or below 0.0060 lb/MMBtu, apparently at reasonable cost and in compliance with the required EPA calibration reference method.[128] In addition, as EPA recognizes, newer technology (i.e., qualitative aerosol generators) exists that would allow for direct PM CEMS calibration at low fPM levels.[129] These facts suggest that that the practical and cost limitations of using PM CEMS at those levels are not substantial. The Attorneys General and Local Governments thus urge EPA to require the use of PM CEMS for low fPM levels, including 0.0060 lb/MMBtu.

D. The Attorneys General and Local Governments Support Continued Evaluation of Strengthened Acid Gas Standards.

EPA is not proposing to modify the existing 0.0020 lb/MMBtu HCl emissions standard (nor the alternative SO_2 emissions standard), which serves as a surrogate for all acid gas HAPs (HCl, HF, SeO_2) emitted by coal-fired power plants.[130] But a significant number of units have demonstrated that readily available technology exists for achieving HCl emissions rates at least as low as 0.00060 lb/MMBtu.[131] Such a limit for HCl should be achievable using existing controls already in place or by adding dry-sorbent injection ("DSI") systems, a proven and affordable technology which also provides co-benefit reductions in SO_2 emissions.[132]

Specifically, using EPA's own technical assessment and supporting data, recent analysis by an independent consultant concludes that:

- Dry FGD systems provide HCl emissions that are below 0.00060 lb/MMBtu. Units that use this technology can already readily achieve that standard.
- Wet FGD systems used to address SO_2 also achieve correlated reductions in HCl, and units using wet FGD that can achieve an SO_2 limit below 0.20 lb/MMBtu can also likely achieve a 0.00060 lb/MMBtu HCl limit. Only six units equipped with wet FGD would need further HCl reductions, such as by upgrading those systems or by adding DSI, to meet a 0.00060 lb/MMBtu HCl limit.
- Units equipped with DSI as well as baghouses have HCl emissions rates well below 0.00060 lb/MMBtu—without need for further controls. Similarly, DSI-equipped units with ESPs that will require fabric filters to comply with a more stringent fPM limit should be able to achieve HCl emissions of 0.00060 lb/MMBtu. And those that do not use fabric filters could achieve that standard at reasonable cost by increasing DSI injection rates or changing coal types.

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128 2023 ATP Assessment, *supra* note 82, at 35, 40-41 (based on Appendix C data from 2023 Technology Review for the Coal- and Oil-Fired EGU Source Category nearly half of the units with PM CEMS reported emissions levels of 0.005 lb/MMBtu or below (70% for stack sampling)).
129 88 Fed. Reg. at 24,874.
130 *Id.* at 24,882-83. *See id.* at 24,858, 24,860 (discussing surrogate relationship), 24,882-83 (same, along with review of technology).
131 2023 ATP Assessment, *supra* note 82, at 45, tbl. 6, 46-49.
132 *Id.*

- Units that are currently "uncontrolled" can meet a 0.00060 lb/MMBtu HCl emissions limit by installing DSI, which numerous other facilities currently use at reasonable cost.[133]

Data readily available to EPA thus appear to demonstrate the achievability and affordability of a more-stringent HCl emissions limit based on existing and/or easily installed HCl controls (or fPM and SO_2 controls with co-benefits for HCl emissions). The Attorneys General and Local Governments thus urge EPA to evaluate that data fully and to consider whether a more stringent HCl standard is warranted.

E. EPA Should Require Shorter Compliance Deadlines for Units that Do Not Need to Make Substantial Upgrades to Comply with the Revised Standards.

EPA proposes to allow 3 years for compliance with each of the proposed revisions to the Standards and seeks comment on whether less time is needed to comply.[134] The Attorneys General and Local Governments urge EPA to calibrate compliance periods to the time reasonably necessary for facilities to comply to ensure reductions of harmful emissions as quickly as possible. Thus, a 3-year compliance period may be appropriate for many units that must install new control devices or retrofit existing control devices to comply with more stringent fPM and mercury standards. For units that need to make operational changes only, however, such as units with existing ACI systems that will need to increase treatment rates, a 1-year compliance deadline is more appropriate. With regard to PM CEMS, 2 years is an appropriate compliance deadline given that two-thirds of units currently do not have such systems in place and the demand for such systems may create manufacturing and installation delays.

CONCLUSION

For all the reasons set forth above, pursuant to section 112(d)(6), EPA should revise the Standards by (1) adopting the proposed 1.2 lb/TBtu mercury standard for lignite-coal-fired units and a more stringent mercury standard for nonlignite coal-fired units of at least 0.65 lb/TBtu; (2) adopting an fPM standard for all coal-fired units of 0.0060 lb/MMBtu and requiring the use of PM CEMS to demonstrate fPM compliance; and (3) incorporating compliance deadlines for those revisions that are reasonable in light of the specific upgrades and operational changes required. We also urge EPA in its final rule to fully evaluate existing data on the achievability and affordability of a more stringent HCl standard and to determine whether such a revision is warranted.

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[133] 2023 ATP Assessment, *supra* note 82, at 43-47.
[134] 88 Fed. Reg. at 24,887.

Respectfully submitted,

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Exhibit 1

Comments of the Commonwealths of Massachusetts and Pennsylvania; the States of California, Connecticut, Delaware, Illinois, Iowa, Maine, Maryland, Minnesota, New Jersey, New Mexico, New York, North Carolina, Oregon, Rhode Island, Vermont, Washington, Wisconsin; the District of Columbia; and the Cities of Baltimore, Chicago, and New York City

on

the Environmental Protection Agency's Proposed "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units— Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding," 87 Fed. Reg. 7624 (Feb. 9, 2022), Docket ID No. EPA-HQ-OAR-2018-0794

April 11, 2022

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The Commonwealths of Massachusetts and Pennsylvania; the States of California, Connecticut, Delaware, Illinois, Iowa, Maine, Maryland, Minnesota, New Jersey, New Mexico, New York, North Carolina, Oregon, Rhode Island, Vermont, Washington, Wisconsin; the District of Columbia; the Cities of Baltimore, Chicago, and New York City (together "States and Local Governments") respectfully submit these comments on the Environmental Protection Agency's ("EPA") proposal entitled "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding," 87 Fed. Reg. 7624 (Feb. 9, 2022) ("Proposal"). The States and Local Governments strongly support the Proposal and EPA's reaffirmation that it is "appropriate and necessary" to regulate emissions of mercury and other hazardous air pollutants ("HAPs") from power plants under section 112 of the Clean Air Act ("Act"), 42 U.S.C. § 7412.

INTRODUCTION

More than twenty years ago, EPA first found it "appropriate and necessary" to regulate power plants under section 112, based on an extensive record reflecting over a decade of scientific research and data on actual power plant emissions. 65 Fed. Reg. 79,825 (Dec. 20, 2000). EPA reaffirmed that finding in 2012 based on a growing body of scientific evidence, 77 Fed. Reg. 9304 (Feb. 16, 2012), and reaffirmed it again in 2016 after considering cost pursuant to the Supreme Court's direction, 81 Fed. Reg. 24,420 (Apr. 25, 2016) ("Supplemental Finding"). The Mercury and Air Toxics Standards ("MATS") Rule, promulgated in 2012 and based on the agency's appropriate and necessary finding, has required power plants to substantially reduce their HAP emissions since that rule's 2015 compliance date. 77 Fed. Reg. 9304, 9418. Nonetheless, years after industry had already installed the controls necessary to comply with MATS, EPA in 2020 attempted to disavow its appropriate and necessary finding in a rulemaking that, as many of the States and Local Governments explained in extensive comments, was illegal, unsupported, and unsupportable. 85 Fed. Reg. 31,286 (May 22, 2020) ("2020 Action"). EPA's current Proposal corrects course, proposing to revoke the unlawful 2020 Action and reaffirming, yet again, that it is appropriate to control some of the most dangerous pollutants from the sources responsible for the greatest volume of emissions.

Industry compliance with MATS over the last several years has resulted in massive reductions of power plant HAP emissions, which have generated, and continue to generate, significant public health, environmental, and economic benefits for the States and Local Governments—and at a fraction of the originally predicted cost. Indeed, the pollutants reduced by MATS—including acid gases, mercury, and other toxic metals such as arsenic, chromium, and nickel—cause severe risks to human health and are especially harmful to certain highly exposed and sensitive populations, including children, communities that rely on subsistence fishing, and communities already disproportionately overburdened by exposure to pollution. Power plant mercury emissions, in particular, are a widespread environmental scourge, contributing to ubiquitous mercury contamination of U.S. waterways and necessitating fish consumption advisories in all fifty states. Overwhelming record evidence demonstrates that the public health and environmental benefits of reducing power plant emissions are vast and, by comparison, the costs of available emission controls are a bargain.

The States and Local Governments thus strongly support EPA's revocation of its 2020 Action and reaffirmation of its appropriate and necessary finding. We fully agree with EPA that the 2020 Action used a flawed methodology that, *inter alia*, inappropriately focused on the size of the small sliver of HAP-reduction benefits that could be monetized; failed to account for distributional impacts on the most exposed and historically marginalized and overburdened populations; improperly disregarded the extensive co-benefits of regulation; and failed to meaningfully account for the great mass of unquantified, but very real, benefits of reducing HAP emissions—such as reducing neurologic and cardiovascular harms, safeguarding Native American ways of life that rely on subsistence fishing, and protecting wildlife and ecosystems. The States and Local Governments also urge EPA to recognize that the 2020 Action was *ultra vires* because the agency attempted to take a deregulatory action outside of section 112's narrowly circumscribed delisting procedures, and to further recognize that the 2020 Action was arbitrary and capricious because, in addition to its unreasonable methodology, EPA failed to account for the reliance interests of states and other entities.

The States and Local Governments fully support EPA's return to a totality of the circumstances approach to the appropriate and necessary determination. That framework is the best way to effectuate the text and purpose of section 112, including Congress's intent that EPA account for all the benefits of HAP reductions, whether or not such benefits have been or can be quantified, and that EPA protect the most exposed and historically marginalized and overburdened populations. The States and Local Governments also commend EPA's work to update the record and provide new estimates of benefits and costs based on the latest science. But for a variety of reasons, even those updated figures remain extremely conservative and underestimate the true value of the MATS Rule.

The States and Local Governments also agree with EPA's conclusion that regulation of power plant HAP emissions is appropriate and necessary under any reasonable framework used to evaluate costs and benefits (either totality of the circumstances or a benefit cost analysis), and no matter which data is used to consider costs and benefits (the original record or an updated record accounting for new information). Although we believe that the law and sound policy favor using a totality of the circumstances approach with the most up-to-date information, we support the prudence of EPA's decision to look at multiple reasonable approaches, which inescapably lead to the same conclusion that regulation is appropriate.

Finally, the States and Local Governments support EPA's decision to seek more information to determine whether, and how, to strengthen the MATS standards as part of a risk and technology review. Because many members of our coalition are downwind of power plants with significant HAP emissions, our residents and natural resources continue to suffer from substantial exposure to mercury and other HAPs. Strengthening the standards would meaningfully reduce the ongoing risks posed by such pollutants, especially for our communities with environmental justice concerns and for populations that historically have been marginalized and overburdened.

DISCUSSION

I. Background

A. The States and Local Governments Face Significant Ongoing Harms from Power Plant Emissions of Mercury and Other HAPs.

For many decades, the States and Local Governments have been grappling with the substantial harms that HAPs emitted from power plants impose on our residents, natural resources, and economies. Yet because large amounts of airborne mercury and other HAPs are transported downwind across state borders, state regulation alone is insufficient, and strong federal standards are essential to curb the cross-border impacts of HAP emissions.

1. Power Plant HAP Emissions Cause Serious Public Health and Natural Resource Harms to the States and Local Governments.

Exposure to the hazardous air pollutants emitted by power plants can cause a wide range of human health harms, including injury to the nervous system and increased risk of pulmonary and cardiovascular disease.[1] But despite the substantial reductions in such pollutants resulting from the MATS standards, power plants remain the Nation's largest source of HAPs, emitting 2.6 tons of mercury (in 2020),[2] along with 4,831 tons of acid gases and 221 tons of non-mercury metals (in 2017). 87 Fed. Reg. at 7640, 7672; 84 Fed. Reg. at 2689, tbl. 4. Those emissions continue to pose significant environmental and health risks, particularly for certain sensitive populations, such as children, and highly exposed populations, such as subsistence fishers and individuals living near power plants, who are disproportionately likely to be communities experiencing poverty or communities of color. *See* 87 Fed. Reg. at 7646–47; 77 Fed. Reg. at 9347, 9441; 76 Fed. Reg. 24,976, 25,018 (May 3, 2011); 65 Fed. Reg. at 79,829; Env't Prot. Agency, *Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards* ("MATS RIA") 7-26, 7-35 to 7-36, 7-40 to 7-41 (2011), Doc. ID No. EPA–HQ–OAR–2009–0234–20131.

Of particular concern to the States and Local Governments are the harms due to mercury emissions from power plants, the source category that contributed half of all domestic mercury emissions before the MATS Rule took effect. 76 Fed. Reg. at 25,002, tbl.3. Mercury emitted by power plants falls back to the earth, where microorganisms convert it to methylmercury, a potent neurotoxin.[3] Methylmercury moves up the food chain in marine and freshwater ecosystems, increasing in concentration as larger predators consume contaminated prey.[4] The primary route

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[1] David L. MacIntosh et al., Env't Health & Eng'g, Inc., *Emissions of Hazardous Air Pollutants from Coal-Fired Power Plants* 5, tbl.1, 35 (2011), https://www.lung.org/getmedia/25962184-d2fc-42f8-b5a3-8ece3257fbab/emissions-of-hazardous-air.pdf.pdf.

[2] Env't Prot. Agency, 2020 Power Sector Programs—Progress Report, 40, 41, fig.1 (2020), https://www3.epa.gov/airmarkets/progress/reports/pdfs/2020_full_report.pdf.

[3] *See* Philippe Grandjean et al., *Adverse Effects of Methylmercury: Environmental Health Research Implications*, 118(8) Env't Health Persp. 1137, 1140–41 (2010), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2920086/pdf/ehp-0901757.pdf; MacIntosh, *supra* note 1, at 16.

[4] MacIntosh, *supra* note 1, at 16.

of methylmercury exposure for humans is eating mercury-contaminated fish. 76 Fed. Reg. at 25,000.[5]

Acute or long-term exposure to methylmercury can lead to numerous harmful health effects. In adults, mercury exposure is linked to an increased risk of diabetes[6] and autoimmune dysfunction,[7] and is strongly correlated with adverse and fatal cardiovascular effects.[8] Children *in utero* and in early developmental stages are particularly susceptible to mercury exposure,[9] which can cause permanent neurological damage.[10] 76 Fed. Reg. at 25,018. Between 2001 and 2018, approximately a hundred thousand children born in the U.S. each year had blood mercury levels exceeding EPA's reference dose.[11] During the same time period, annual testing of blood mercury levels in adults nationwide indicated that mercury exposure has put millions at risk of fatal heart disease and more than ten million at risk of non-fatal heart disease.[12]

Power plants also emit huge volumes of toxic acid gases and non-mercury metals. In 2010, power plants were the Nation's largest emissions source of many of those pollutants, including hydrogen chloride, hydrogen fluoride, and selenium, and a major emissions source of others, including arsenic, chromium, nickel, and cobalt. 87 Fed. Reg. at 7637, 7640. Arsenic, chromium, and nickel are classified as human carcinogens, while cadmium, selenium, and lead

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[5] Elsie M. Sunderland, Miling Li, & Kurt Bullard, *Decadal Changes in the Edible Supply of Seafood and Methylmercury Exposure in the United States*, 126(1) Env't Health Persp. 017006-1, 017006-2 (2018), https://ehp.niehs.nih.gov/doi/pdf/10.1289/EHP2644 (finding that estuarine and marine seafood accounted for an estimated eighty-two percent of the U.S. population's methylmercury intake between 2010 and 2012).

[6] Ka He et al., *Mercury Exposure in Young Adulthood and Incidence of Diabetes Later in Life: The CARDIA Trace Element Study*, 36 Diabetes Care 1584, 1587 (2013), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3661833/pdf/1584.pdf.

[7] Jennifer F. Nyland et al., *Biomarkers of Methylmercury Exposure Immunotoxicity among Fish Consumers in Amazonian Brazil*, 119(12) Env't Health Persp. 1733, 1736–37 (2011), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3261989/pdf/ehp.1103741.pdf.

[8] Giuseppe Genchi et al., *Mercury Exposure and Heart Diseases*, 14(1) Int'l J. Env't Rsch. & Pub. Health 1, 8–9 (2017), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5295325/pdf/ijerph-14-00074.pdf.

[9] Stephanie Bose-O'Reilly et al., *Mercury Exposure and Children's Health*, 40(8) Current Probs. in Pediatric & Adolescent Health Care 186, 186 (2010), https://doi.org/10.1016/j.cppeds.2010.07.002.

[10] *See also* Pub. Health & Env't, World Health Org., *Exposure to Mercury: A Major Public Health Concern* 3 (2021), https://www.who.int/publications-detail-redirect/9789240023567#:~:text=Mercury%20is%20highly%20toxic%20to,%2C%20methyl%2D%20and%20ethylmercury (neurological symptoms of prenatal methylmercury exposure can include "intellectual disability, seizures, vision and hearing loss, delayed development, language disorders and memory loss").

[11] Elsie Sunderland et al., *Mercury Science and the Benefits of Mercury Regulation* 23–24 & fig.11 (Dec. 16, 2021) (White Paper, Harvard T.H. Chan School of Health Center for Climate, Health, & the Glob. Env't), https://cdn1.sph.harvard.edu/wp-content/uploads/sites/2343/2021/12/Mercury_WhitePaper_121621.pdf.

[12] *Id.*

are considered probable human carcinogens. *Id.* at 7640. And more broadly, exposure to non-mercury HAPs is associated with a variety of other serious health conditions that include adverse neurological, cardiovascular, immunological, reproductive, liver, kidney, and respiratory effects. *Id.* at 7640; 77 Fed. Reg. at 9363; 76 Fed. Reg. at 25,003, 25,016; MATS RIA at 4-68 to 4-73.

As EPA has recognized, the serious human health harms caused by exposure to power plant HAP emissions disproportionately affect certain highly exposed populations within our borders. 87 Fed. Reg. at 7646–47; 77 Fed. Reg. at 9354, 9441; 76 Fed. Reg. at 24,977–78, 25,018. Communities living closest to power plants—generally within a three-mile radius—face greater exposure to most HAPs. MATS RIA at 7-36. And because seafood consumption is the main route for methylmercury exposure, populations that consume higher amounts of fish, including for socio-economic or cultural reasons, are at greater risk.[13] In Tribal communities, where self-caught fish is often an important source of affordable protein and cultural and spiritual connection,[14] methylmercury exposure through fish consumption is estimated to be three to ten times higher than that of the U.S. population as a whole.[15] For example, in Wisconsin, many Anishinaabe People (the Ojibwe or Chippewa Peoples) consume walleye—a species both subject to mercury fish consumption advisories and essential to maintaining a traditional way of life[16]—at significantly higher rates than the rest of the state's population.[17] Similarly, fishers experiencing poverty in urban areas, especially members of communities of color and immigrant populations, face greater risk because self-caught fish tends to make up a

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[13] *See* Collin A. Eagles-Smith et al., *Modulators of Mercury Risk to Wildlife and Humans in the Context of Rapid Global Change*, 47(2) Ambio 170, 177–78 (2018), https://pubmed.ncbi.nlm.nih.gov/29388128/; Mass. Dep't of Pub. Health, *Massachusetts State Health Assessment* 80 (2017), https://www.mass.gov/doc/2017-massachusetts-state-health-assessment/download; Nat'l Env't Just. Advisory Council, *Fish Consumption and Environmental Justice* 2–4, 14, 26 (2002), https://www.epa.gov/sites/default/files/2015-02/documents/fish-consump-report_1102.pdf.

[14] *See* Great Lakes Comm'n, *Issue Brief: Mercury Contamination in the Great Lakes Basin* 6 (2021), https://www.glc.org/wp-content/uploads/GLC-Mercury-Issue-Brief-Final-Oct-2021.pdf, ("Methylmercury contamination in Great Lakes fish is an environmental justice issue for indigenous communities that depend on fish as a large part of their diet."); Eagles-Smith et al., *supra* note 13, at 1478; Nat'l Env't Just. Advisory Council, *supra* note 13, at 4–7, 17–18, 138.

[15] Jianping Xue et al., *Modeling Tribal Exposures to Methyl Mercury from Fish Consumption* 533 Sci. Total Env't 102, 108 (2015), https://pubmed.ncbi.nlm.nih.gov/26151654/.

[16] Adam D. DeWeese et al., *Efficacy of Risk-Based, Culturally Sensitive Ogaa (Walleye) Consumption Advice for Anishinaabe Tribal Members in the Great Lakes Region*, 29(5) Risk Analysis 729, 729–30 (2009), https://pubmed.ncbi.nlm.nih.gov/19220800/ (importance of walleye to the Anishinaabe); Wis. Dep't Nat. Res., *Choose Wisely: A Health Guide for Eating Fish in Wisconsin* 4 (2020), https://widnr.widen.net/s/2zs8brgxcg/fh824 (consumption advisories for walleye).

[17] *Compare* DeWeese et al., *supra* note 16, at 738 & tbl.III (mean consumption of 1.5 meals per month (18 meals per year)) *with* Nancy A. Connelly et al., *Factors Affecting Fish Consumption among Anglers Living in the Great Lakes Region*, 12-3 Hum. Dimensions Rsch. Unit Publ'n Series 37, tbl.28 (2012), https://ecommons.cornell.edu/bitstream/handle/1813/40457/HDRUReport12-3.pdf?sequence=1&isAllowed=y (mean consumption of 2.7 meals per year).

greater proportion of their diets.[18] In addition, fishers in these populations are less likely to travel to safer fishing areas due to income and transportation limitations[19] and are less likely to trust or follow fish advisories for a variety of reasons, including cultural, linguistic, and literacy barriers.[20] Within the U.S. population of "high-frequency" fish consumers, individuals with lower incomes and less than a high school education show the highest fish consumption rates, while individuals identifying as "Black, non-Hispanic" and "Asian, Pacific Islander, and Native American descent" are represented at a significantly higher proportion than in the general U.S. population.[21]

Blood mercury data show similar demographic trends. National data from 2000 to 2018 show that individuals identifying as Asian, Pacific and Caribbean Islander, or Native American, among others, have higher mercury blood levels than other demographic groups.[22] Asian

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[18] *See* Mass. Dep't Pub. Health, *supra* note 13, at 80 ("Greater health risks from consuming contaminated fish occur more often in EJ areas because residents often depend on locally-caught fish as a regular part of their diet."); Susan L. Schantz et al., *Contaminant profiles in Southeast Asian immigrants consuming fish from polluted waters in northeastern Wisconsin*, 110(1) Env't Res. 33, 39–40 (2010), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2795147/ (finding elevated contaminant levels in Hmong communities in Green Bay, Wisconsin area due to consumption of locally caught contaminated fish); Joanna Burger et al., *Fishing in Urban New Jersey: Ethnicity Affects Information Sources, Perception, and Compliance*, 19(2) Risk Analysis 217, 221–22, 225 (1999), https://pubmed.ncbi.nlm.nih.gov/10765401/ (finding that Black and Hispanic urban fishers consumed greater proportion of self-caught fish and were less aware of fish consumption advisories and consumption risks than White fishers).

[19] *See* Komal Basra, M. Patricia Fabian, & Madeleine K. Scammell, *Consumption of Contaminated Seafood in an Environmental Justice Community: A Qualitative and Spatial Analysis of Fishing Controls*, 11(1) Env't Just. 6, 13 (2018), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5830855/; Mass. Dep't Pub. Health, *supra* note 13, at 80; Nat'l Env't Just. Advisory Council, *supra* note 13, at 6.

[20] Basra et al., *supra* note 19, 11–12; Andrew L. Stevens, Ian G. Baird, & Peter B. McIntyre, *Differences in Mercury Exposure among Wisconsin Anglers Arising from Fish Consumption Preferences and Advisory Awareness*, 43(1) Fisheries 31, 33, 38, 39 (2018), https://afspubs.onlinelibrary.wiley.com/doi/10.1002/fsh.10013; Emily Oken et al., *Which Fish Should I Eat? Perspectives Influencing Fish Consumption Choices*, 120(6) Env't Health Persp. 790, 794 (2012), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3385441/; Nat'l Env't Just. Advisory Council, *supra* note 13, at iv–v, 2–10, 91–98 (detailing the nutritional, economic, cultural, and other factors that prevent many environmental justice communities from following conventional fish consumption advisories).

[21] Katherine von Stackelberg, Miling Li, & Elsie Sunderland, *Results of a National Survey of High-Frequency Fish Consumers in the United States*, 158 Env't Rsch. 126, 128, 129, tbl.2, 130, fig.1 (2017), https://www.sciencedirect.com/science/article/abs/pii/S0013935117304024. An individual was defined as a "high frequency" consumer if they consumed three or more fish meals per week, corresponding to the 90-95th percentile seafood consumer in the National Health and Nutrition Examination Survey. *Id.* at 127.

[22] Sunderland et al. (2021), *supra* note 11, at 25 & fig.12.

communities in both the San Francisco Bay Area[23] and New York City,[24] for example, have registered blood-mercury concentrations exceeding levels of concern because their diets include large amounts of fish.

2. Nationwide Emissions Standards Are Essential to Addressing Harmful Cross-Border Impacts of Power Plant Emissions of Mercury and Other HAPs.

Today, as before the MATS standards took effect, mercury contamination of U.S. waters is nearly ubiquitous. Nearly 73,000 river and stream miles and 8,508,000 acres of lakes, reservoirs, and ponds nationwide are designated as impaired under Clean Water Act section 303(d), 33 U.S.C. § 1313(d), due to mercury contamination.[25] In thirteen states—Connecticut, Florida, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, South Dakota, and Vermont—mercury contamination has become significant enough to require the development of state- or region-wide "total maximum daily loads" or "TMDLs" to meet Clean Water Act water quality standards.[26] *See* 33 U.S.C.

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[23] *See* Lauren Baehner, *Metal Levels in Asian/Pacific Island Community Exposures (ACE) Project*, BioMonitoring California Scientific Guidance Panel Meeting 6, 11, 21, 24 (Nov. 8, 2018), https://biomonitoring.ca.gov/events/biomonitoring-california-scientific-guidance-panel-meeting-november-2018 (study participants with blood-mercury level exceedances had high rates of store-bought fish relative to those without exceedances).

[24] Wendy McKelvey et al., *A Biomonitoring Study of Lead, Cadmium, and Mercury in the Blood of New York City Adults*, 115(10) Env't Health Persp. 1435, 1439–40 & tbl.3 (2007), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2022653/ (Asian participants had significantly higher blood-mercury levels and reported significantly higher fish consumption than other ethnic groups surveyed).

[25] Env't Prot. Agency, *National Causes of Impairment, National Summary of Impaired Waters and TMDL Information*, https://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.control#causes.

[26] *See* Env't Prot. Agency, *Northeast Regional Mercury Total Maximum Daily Load* vi (2007), https://www.mass.gov/doc/northeast-regional-mercury-total-maximum-daily-load-final-addendum-for-massachusetts/download [Northeast TMDL]; Fla. Dep't of Env't Prot., *Mercury TMDL for the State of Florida* (2013), https://floridadep.gov/sites/default/files/Mercury-TMDL.pdf [Florida TMDL]; Mich. Dep't of Env't Quality & Env't Prot. Agency, *Michigan Statewide Mercury Total Maximum Daily Load* (2018), http://www.michigan.gov/documents/deq/wrd-swas-hgtmdl-draft_415360_7.pdf [Michigan TMDL]; Minn. Pollution Control Agency, *Minnesota Statewide Mercury Total Maximum Daily Load* (2007), http://www.pca.state.mn.us/index.php/view-document.html?gid=8507 [Minnesota TMDL]; N.J. Dep't of Env't Prot., *Total Maximum Daily Load for Mercury Impairments Based on Concentration in Fish Tissue Caused Mainly by Air Deposition to Address 122 HUC 14s Statewide* (2009), https://www.nj.gov/dep/wms/bears/docs/TMDL%20HG%20document%20final%20version%209-8-09_formated%20for%20web%20posting%20js.pdf [New Jersey TMDL]; N.C. Dep't of Env't Quality, *North Carolina Mercury TMDL* (2012), http://portal.ncdenr.org/c/document_library/get_file?uuid=aecb3619-c246-4b49-bfd8-fd5541775110&groupId=38364 [North Carolina TMDL]; S.D. Dep't of Env't and Nat. Res., *South Dakota Mercury Total Maximum Daily Load* (2016), https://ofmpub.epa.gov/waters10/attains_impaired_waters.show_tmdl_document?p_tmdl_doc_blobs_id=78603;

§ 1313(d)(1) (requiring development of TMDLs for impaired waters). Numerous other states have developed waterbody-specific mercury TMDLs within their borders.[27] That mercury contamination not only harms our residents when they consume contaminated fish, but also limits their ability to enjoy the benefits of recreational fisheries; it also reduces the economic value of the States and Local Governments' recreational and commercial fisheries. *See infra* Section I.B.2.

For decades, the States and Local Governments have sought to reduce the public health and natural resource harms posed by the widespread mercury contamination of our waters. To limit public exposure, we have relied heavily on fish consumption advisories. Indeed, all fifty states have had mercury-related fish consumption advisories in place,[28] and as recently as 2018, over 4,000 fish advisories "affect[ed] almost half of the nation's lake acreage, river miles, and coastlines."[29] Such advisories, however, are often less effective in protecting many of our most highly exposed communities.[30] Many of the undersigned States also have taken regulatory action to reduce emissions of mercury from power plants and other sources within our borders.[31] At least fourteen states have promulgated limits on mercury emissions from power plants,[32] and

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https://ofmpub.epa.gov/waters10/attains_impaired_waters.show_tmdl_document?p_tmdl_doc_blobs_id=78604 [South Dakota TMDL].

[27] *See* Env't Prot. Agency, *TMDL Pollutant Group: Mercury*, https://iaspub.epa.gov/tmdl_waters10/attains_impaired_waters.tmdls?p_pollutant_group_id=693 (showing that thirty-two states have at least one mercury TMDL and some states have dozens).

[28] Env't Prot. Agency, *2011 National Listing of Fish Advisories* 4 (2013), https://19january2017snapshot.epa.gov/sites/production/files/2015-06/documents/technical-factsheet-2011.pdf; *see also* IEc Report at 6–10 (describing fish consumption advisories and other actions taken by states, the federal government, and non-governmental actors to limit public exposure to mercury in fish and shellfish).

[29] Valoree S. Gagnon, Hugh S. Gorman, & Emma S. Norman, Great Lakes Rsch. Ctr., *Eliminating the Need for Fish Consumption Advisories in the Great Lakes Region* 3 (2018), https://www.mtu.edu/social-sciences/docs/res-fishconsumption-policybrief-030718.pdf.

[30] *See supra* notes 19 & 20.

[31] *See* Barbara Morin & Paul J. Miller, Northeast States for Coordinated Air Use Mgmt. ("NESCAUM"), *It Remains "Appropriate and Necessary" to Regulate Toxic Air Emissions from Coal- and Oil-fired Electric Generating Units* 8–9 (Apr. 7, 2022), https://www.nescaum.org/documents/nescaum-it-remains-approp-necess-reg-air-toxics-from-coal-oil-egus-update-20220407.pdf/; Great Lakes Comm'n, *supra* note 13, at 19–28 (describing Great Lakes states' regulatory programs).

[32] In fact, power plants in Connecticut, Massachusetts, and New Jersey were complying with those states' mercury standards three to four years before EPA's proposal of the MATS Rule in 2011. Conn. Gen. Stat. § 22a-199 (compliance by July 1, 2008); 310 Mass. Code Regs. § 7.29 (first phase compliance by Jan. 1, 2008); N.J. Admin. Code § 7:27-27.7 (compliance by Dec. 15, 2007); *see also* 5 Colo. Code Regs. § 1001-8:B.VIII (first phase compliance by Jan. 1, 2012); Del. Admin. Code tit. 7 § 1146-6 (first phase compliance by Jan. 1, 2009); Ill. Admin. Code tit. 35 § 225.230 (compliance by July 1, 2009); Md. Code Regs. tit. 26, § 11.27.03.D (first phase compliance by Jan. 1, 2010); Minn. R. 7011.0561 (first phase compliance by Jan. 1, 2018); Mont. Admin. R. 17.8.771 (compliance by Jan. 1, 2010); N.H. Rev. Stat. Ann. § 125-O:11-18

nearly every state with power plant mercury emission standards has imposed more health-protective limits than the MATS Rule.[33]

State requirements, however, have not solved, and cannot solve, the problem of interstate hazardous air pollution. Mercury can travel hundreds of miles from the smokestack. *See* 77 Fed. Reg. at 9444. Thirty percent of Minnesota's mercury deposition, for example, originates from out-of-state domestic sources.[34] And a significant portion of Northeast mercury deposition originates from uncontrolled power plants located in other states.[35] Unless those out-of-state power plant emissions are addressed, Northeast waters will not meet federal water quality standards, and our residents and fisheries will continue to suffer.[36] Further, mercury-contaminated fish are bought and sold in interstate commerce, and individuals who consume store-bought fish thus suffer the downstream effects of power plant toxic emissions even though they may not reside downwind of the source of the emissions.[37] Rigorous, nationally-uniform standards are thus essential to protect the States and Local Governments' residents, natural

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(compliance by July 1, 2013); N.Y. Comp. Codes R. & Regs. tit. 6 § 246.6 (first phase compliance by Jan. 1, 2010); Or. Admin. R. 340-228-0606 (compliance by July 1, 2012); Wis. Admin. Code NR § 446.13 (compliance by Apr. 16, 2016); *see also* Mich. Admin. Code r. 336.2503(1)(a)-(b) (2009) (compliance by Jan. 1, 2015), *modified by* Mich. Admin. Code r. 336.2502a (2013) (exempting covered power plants "for which [MATS] is an applicable requirement relative to emissions of mercury" and, if the Rule ceases to be an applicable requirement, extending compliance date to the sooner of three months from the date of inapplicability or April 16, 2015).

[33] The MATS Rule imposes a mercury emission standard of 1.2 lb/TBtu or 0.013 lb/GW-hr. *See* 77 Fed. Reg. at 9367 tbl.3. Most state rate-based standards are set at 0.6 lb/TBtu or 0.008 lb/GW-hr. *See* Conn. Gen. Stat. § 22a-199(b)(1) (0.6 lb/TBtu); Del. Admin. Code tit. 7 § 1146–6.2 (0.6 lb/TBtu); Ill. Admin. Code tit. 35 § 225.230(a)(1)(A) (0.008 lb/GW-hr); 310 Mass. Code Regs. § 7.29(5)(a)(3)(f) (0.0025 lb/GW-hr); Mich. Admin. Code r. 336.2503(1)(b) (0.008 lb/TBtu); Minn. R. 7011.0561 (0.008 lb/TBtu); Mont. Admin. R. 17.8.771(1)(b)(ii) (0.9 lb/TBtu); N.J. Admin. Code § 7:27-27.7(a) (3.00 mg/MWh (equivalent to 0.66 lb/TBtu)); N.Y. Comp. Codes R. & Regs. tit. 6 § 246.6(a) (0.6 lb/TBtu); Or. Admin. R. 340-228-0606(1) (0.6 lb/TBtu); Wis. Admin. Code NR § 446.13(1) (0.008 lb/GW-hr).

[34] Minnesota TMDL, *supra* note 26, at 20–21, 45 (stating that federal regulation of those sources, such as power plants, holds most promise for reaching Minnesota's TMDL goals); *see also* New Jersey TMDL, *supra* note 26, at 31 (noting that twenty-six percent of New Jersey's air deposition mercury load originates from five surrounding states); North Carolina TMDL, *supra* note 26, at 6 (noting that fifteen percent of North Carolina's total mercury deposition originates from out-of-state regional sources); *see also Illinois Lake Michigan (nearshore) Mercury Final TMDL Report* 23 (2016), https://attains.epa.gov/attains-public/api/documents /actions /IL_EPA/IL-2019-002/135221 (relying on the MATS Rule to address out-of-state regional sources contributing twelve percent of the mercury deposition load).

[35] *See* NESCAUM, *supra* note 31, at 7.

[36] *See* Northeast TMDL, *supra* note 26, at 44 (concluding that EPA action to "implement significant reductions from upwind out-of-region sources, primarily coal-fired power plants" is necessary to return fish methylmercury concentrations to safe levels).

[37] *See* Baehner, *supra* note 23.

resources, and economies from the dangerous quantities of mercury and other hazardous air pollution that out-of-state power plants emit.

B. The States and Local Governments Have Benefited from the Reductions in Power Plant HAP Emissions Required by the MATS Rule.

Since the MATS Rule took effect, it has generated, and continues to generate, massive reductions in HAP emissions that are essential to protecting public health and the environment and leveling the regulatory playing field across the country.

1. Public Health Benefits

Power plant mercury emissions declined by 91 percent between 2010 and 2020 (from 29 tons to 2.6 tons), and acid gas and non-mercury metal HAP emissions declined by 96 and 81 percent, respectively, between 2010 and 2017. 87 Fed. Reg. at 7648; 84 Fed. Reg. at 2689, tbl. 4.[38] With regard to mercury, research confirms that the MATS Rule "has reduced mercury loadings to aquatic systems, in turn leading to a reduction in mercury levels in fish and shellfish."[39] ***Exhibit A***, Robert E. Unsworth et al., Industrial Economics, Inc., *The Economic Benefits of the Mercury and Air Toxics Standards (MATS) Rule to the Commercial and Recreational Fishery Sectors of Northeast and Midwest States* 3, 5–6 (2019) ("IEc Report"). For instance, studies have found that decreased mercury emissions corresponded with declines in mercury contamination in waterbodies and freshwater and saltwater fish species, including Atlantic Bluefin tuna,[40] mid-Atlantic bluefish,[41] and largemouth bass and yellow perch in Massachusetts.[42]

As EPA recognizes, the reductions in mercury contamination attributable to the MATS Rule have produced large, ongoing public health benefits for the residents of the States and Local Governments. EPA has estimated the annual benefits to include preventing the loss of thousands of IQ points in prenatally exposed children nationwide, and nearly a hundred fewer fatal heart attacks due to reduced mercury contamination in commercial fish. 87 Fed. Reg. at 7644. While those benefits, which EPA values annually at up to $53 million and $720 million, respectively, are substantial, they represent a small subset of the full benefits attributable to the Rule's pollution reductions. *See id.* at 7646; Env't Prot. Agency, *National-Scale Mercury Risk Estimates*

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[38] Env't Prot. Agency, *supra* note 2, at 40–41.

[39] *See also* NESCAUM, *supra* note 31, at 14–15; Sunderland et al. (2021), *supra* note 11, at 9.

[40] Cheng-Shiuan Lee et al., *Declining Mercury Concentrations in Bluefin Tuna Reflect Reduced Emissions to the North Atlantic Ocean*, 50(23) Env't Sci. & Tech. 12,825, 12,829–30 (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5161346/.

[41] Ford A. Cross, David W. Evans, & Richard T. Barber, *Decadal Declines of Mercury in Adult Bluefish (1972-2011) from the Mid-Atlantic Coast of the U.S.A.,* 49 Env't Sci. Tech. 9064, 9068 (2015), https://pubmed.ncbi.nlm.nih.gov/26148053/#:~:text=Concentrations%20of%20mercury%20decreased%20by,of%20about%2010%25%20per%20decade; *see also* Brian Bienkowski, *Cleaner Bluefish Suggest Coal Rules Work,* Sci. American (July 20, 2015), http://www.scientificamerican.com/article/cleaner-bluefish-suggest-coal-rules-work/.

[42] Michael S. Hutcheson et al., *Temporal and Spatial Trends in Freshwater Fish Tissue Mercury Concentrations Associated with Mercury Emissions Reductions*, 48(4) Env't Sci. Tech. 2193, 2197-99 (2014), https://www.ncbi.nlm.nih.gov/pubmed/24494622.

for Cardiovascular and Neurodevelopmental Outcomes for the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units – ("2021 TSD") 25, 26 (Sept. 2, 2021), Doc. ID No. EPA-HQ-OAR-2018-0794-4605. Other studies considering a wider variety of avoided cardiovascular harms and broader economic impact have estimated significantly larger benefits from the MATS Rule. A 2016 study projected total Rule-related economy-wide benefits through 2050 of at least $43 billion due to avoided IQ deficits and avoided fatal and non-fatal heart attacks.[43] And other research estimates the societal costs of decreased IQ, alone, from anthropogenic mercury exposure in the United States at billions of dollars per year.[44]

The States and Local Governments have also benefitted from the MATS Rule's massive reductions in power plant emissions of acid gases and toxic non-mercury metals. *See* 87 Fed. Reg. at 7648; 84 Fed. Reg. at 2689, tbl. 4. Although EPA has not been able to quantify these

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[43] Amanda Giang & Noelle E. Selin, *Benefits of mercury controls for the United States*, 113(2) Proc. of the Nat'l Acad. of Sci. 286, 288 (2016), https://www.pnas.org/content/pnas/113/2/286.full.pdf; *see also* Elsie Sunderland et al., *A Template for a State-of-the-Science Assessment of the Public Health Benefits associated with Mercury Emissions Reductions for Coal-fired Electricity Generating Units* 12–13 (Apr. 11, 2022) (White Paper, Harvard T.H. Chan School of Health Ctr. for Climate, Health, & the Glob. Env't), https://cdn1.sph.harvard.edu/wp-content/uploads/sites/2343/2022/04/MATSTemplateAnalysis_041122b.pdf (estimating that power plant mercury emissions reductions between 2010 and 2020 produced monetized benefits of $1.2 billion from avoided cardiovascular deaths and $25 million from avoided IQ deficits across the U.S. population); Vincent Nedellec & Ari Rabl, *Costs of Health Damage from Atmospheric Emissions of Toxic Metals: Part 2—Analysis for Mercury and Lead*, 36(11) Risk Analysis 1, 1, 4–5, & tbl.1 (2016), https://www.researchgate.net/profile/Nedellec-Vincent/publication/298908575_Costs_of_Health_Damage_from_Atmospheric_Emissions_of_Toxic_Metals_Part_2-Analysis_for_Mercury_and_Lead/links/5ae740c70f7e9b837d38255e/Costs-of-Health-Damage-from-Atmospheric-Emissions-of-Toxic-Metals-Part-2-Analysis-for-Mercury-and-Lead.pdf (estimating that the damage cost associated with one kilogram of mercury is 22,937 € (2013) if there is a no-effect threshold, and 52,129 € (2013) if there is none, with ninety-one percent of the cost due to mortality from heart disease and the rest from IQ loss); Glenn E. Rice, James K. Hammit, & John S. Evans, *A Probabilistic Characterization of the Health Benefits of Reducing Methyl Mercury Intake in the United States*, 44(13) Env't Sci. & Tech. 5216, 5221 (2010), https://pubs.acs.org/doi/10.1021/es903359u (considering avoided IQ deficits and fatal heart attacks, annual benefit of $860M associated with 10% reduction in MeHg exposure in U.S. population).

[44] Philippe Grandjean & Martine Bellanger, *Calculation of the disease burden associated with environmental chemical exposures: application of toxicological information in health economic estimation*, 16(123) Env't Health 1, 4, tbl.1, 5 (2017), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5715994/pdf/12940_2017_Article_340.pdf; *see also* Leonardo Trasande et al., *Public Health and Economic Consequences of Methyl Mercury Toxicity to the Developing Brain*, 113(5) Env't Health Persp. 590, 593–4, & tbl.1, fig.1 (2005), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1257552/ (documenting $8.7 billion in annual costs from lost productivity alone of methylmercury toxicity, $1.3 billion of which is attributable each year to mercury emissions from U.S. power plants).

benefits, it recognizes the significant health and environmental risks posed by the very high volumes of those HAPs emitted by power plants prior to implementation of the Rule. 87 Fed. Reg. at 7640; 77 Fed. Reg. at 9363. In addition, because of the way the pollution-control technologies installed to comply with the MATS Rule operate, the Rule has drastically reduced harmful criteria pollutants, such as sulfur dioxide and particulate matter, in addition to HAPs.[45] The value of those emission reductions is likewise enormous, including tens of thousands of fewer premature deaths each year and a wide array of other avoided adverse public health outcomes.[46] *See infra* Section III.B.1.

In terms of the distributional effects of the benefits of the MATS Rule's pollution reductions, EPA acknowledged that in 2010 populations living within three miles of coal-fired power plants disproportionately consisted of communities of color and individuals living in poverty. MATS RIA at 7-35 to 7-36. Similarly, EPA's watershed-based risk assessment indicates that low-income Black subsistence fishers in the Southeast, and likely also Tribal subsistence fishers in the Great Lakes region, face disproportionately high risks of fatal heart attacks from power plant methylmercury exposures. 87 Fed. Reg. at 7647, 2021 TSD at 20–22, tbl. 3.

2. Natural Resource and Fisheries Benefits

In addition to the substantial public health benefits attributable to reduced exposure to mercury and other HAPs, the MATS Rule has significantly reduced harms to natural resources within our borders that are, in many cases, owned or held in trust by State members of our coalition. Notably, methylmercury causes death and reproductive and behavioral harm in a wide range of piscivorous and insectivorous fish and wildlife.[47] 87 Fed. Reg. at 7640–42; 81 Fed. Reg. at 24,423; 65 Fed. Reg. at 79,830 (wildlife mercury exposures can be substantial because animals tend to consume fish from limited geographic areas). Mercury contamination of fisheries is of

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[45] For instance, between December 2014 and April 2016, dry sorbent injection systems were installed on 15 gigawatts of coal capacity and flue gas desulfurization systems (also known as scrubbers) were installed on 12 gigawatts of coal capacity. U.S. Energy Info. Admin., *EIA Electricity Generator Data Show Power Industry Response to EPA Mercury Limits*, Today in Energy (July 7, 2016), https://www.eia.gov/todayinenergy/detail.php?id=26972. During 2015, those plants burned eighteen percent less coal than in 2014, but reduced their sulfur dioxide emissions by forty-nine percent. U.S. Energy Info. Admin., *Sulfur Dioxide Emissions from U.S. Power Plants Have Fallen Faster Than Coal Generation*, Today in Energy (Feb. 3, 2017), https://www.eia.gov/todayinenergy/detail.php?id=29812.

[46] Vivian E. Thomson, Kelsey Huelsman, & Dominique Ong, *Coal-fired power plant regulatory rollback in the United States: Implications for local and regional public health*, 123 Energy Pol'y 558, 559 (2018), https://www.sciencedirect.com/science/article/pii/S030142151830627X.

[47] *See* NESCAUM, *supra* note 31, at 15–16; D.C. Evers et al., *A Synthesis of Patterns of Environmental Mercury Inputs, Exposure and Effects in New York State*, 29(10) Ecotoxicology 1565, 1577–79 (2020), https://pubmed.ncbi.nlm.nih.gov/33170395/; Christopher D. Knightes et al., *Application of Ecosystem-Scale Fate and Bioaccumulation Models to Predict Fish Mercury Response Times to Changes in Atmospheric Deposition*, 28(4) Env't Sci. & Tech. 881, 881–88 (2009), https://doi.org/10.1897/08-242R.1. In addition, power plant acid gas emissions contribute to acidification of freshwater aquatic ecosystems and concomitant adverse effects to aquatic organisms. 87 Fed. Reg. at 7641.

special concern to the States and Local Governments because it can reduce the size and sustainability of those resources[48] and has necessitated the issuance of fish consumption advisories and other mercury-risk warnings, which in turn reduce recreational fishing as well as the consumption of commercially harvested fish and shellfish. IEc Report at 2–3, 10–13.

Because power plant mercury emissions "are a significant contributor to total mercury levels in fish and shellfish in the Northeast and Midwest states," the MATS Rule has benefitted the States and Local Governments by reducing mercury in our recreational and commercial fisheries. IEc Report at 2–3. The value of those reductions to our economies is substantial. Recreational fishing directly contributes more than $7.5 billion per year to the economies of the twelve Northeast and Midwest states considered in the IEc report. *Id.* at 3, 16. When jobs and expenditures associated with those states' recreational and commercial fisheries are considered, the overall economic value is enormous. In total, "the $12.0 billion in annual recreational fishing expenditures and the $1.6 billion in annual commercial fish landings for th[o]se [twelve] states result in a regional economic contribution of 276,696 full-time and part-time jobs, $8.7 billion in earnings, $17.2 billion in value added, and $28.1 billion in output." *Id.* at 22. Thus, even small changes to recreator and consumer behavior associated with reduced contamination from power plant mercury emissions could produce "substantial economic impacts to related economic industries at the state or regional level." *See id.* at 22–23.

3. Regulatory Benefits

Finally, in addition to the direct health, environmental, and economic benefits described above, many of the States and Local Governments also benefit from and rely on pollution reductions provided by the MATS Rule to satisfy other pollution-control requirements or goals, including to meet TMDL goals under the Clean Water Act. *See supra* Section I.A.2. Emissions reductions under the MATS Rule also play a key role in state compliance with other Clean Air Act programs, including satisfying national ambient air quality standards for various pollutants that are affected by the MATS Rule, such as sulfur dioxide and particulate matter, and achieving reasonable progress goals under regional haze plans.[49]

In sum, the MATS Rule is providing enormous continuing health, environmental, economic, and regulatory benefits to the States and Local Governments.

C. The History of Regulation and Litigation Surrounding EPA's Regulation of Power Plant HAP Emissions.

Because of our substantial interests in combating the harms of hazardous air pollutants, the States and Local Governments have been advocating for decades, in myriad ways, for strong federal regulation of power plant HAPs. EPA's Proposal, which these comments support, is the latest in a long line of EPA actions addressing the question whether it is appropriate and necessary to regulate HAP emissions from power plants under section 112.

In the 1990 amendments to the Act, Congress directed EPA to regulate emissions of hazardous air pollutants from power plants under section 112 if, after studying the public health hazards of those emissions, the agency determined that such regulation was "appropriate and

[48] *See* Evers et al., *supra* note 47, at 1577–78.
[49] NESCAUM, *supra* note 31, at 19–20.

necessary." 42 U.S.C. § 7412(n)(1)(A). EPA did just that in 2000, finding that it is "appropriate to regulate HAP emissions from coal- and oil-fired electric utility steam generating units under section 112 of the CAA because . . . [those] units are the largest domestic source of mercury emissions, and mercury in the environment presents significant hazards to public health and the environment," and because "control options" exist that "effectively reduce HAP emissions from such units." 65 Fed. Reg. 79,825, 79,830 (Dec. 20, 2000). EPA further explained that it is "necessary to regulate HAP emissions from coal- and oil-fired electric utility steam generating units under section 112 of the CAA because the implementation of other requirements under the CAA will not adequately address the serious public health and environmental hazards arising from such emissions." *Id.* Accordingly, EPA listed power plants as a source category to be regulated under section 112. 67 Fed. Reg. 6521, 6522, 6524 (Feb. 12, 2002).

Five years after this appropriate and necessary determination, EPA sought—illegally—to reverse it and remove power plants from the list of regulated source categories. 70 Fed. Reg. 15,994 (Mar. 29, 2005); 70 Fed. Reg. 28,606 (May 18, 2005). A coalition of states, including many of those commenting here, filed suit. *New Jersey v. EPA*, 517 F.3d 574 (D.C. Cir. 2008). In 2008, the D.C. Circuit vacated EPA's action, holding that EPA could not meet section 112's specific criteria allowing for delisting unless certain health and environmental thresholds were satisfied. 517 F.3d at 582 (citing 42 U.S.C. § 7412(c)(9)).

In 2012, EPA reaffirmed its 2000 appropriate and necessary finding, based on both the 2000 record and updated scientific and public health evidence (detailed in an extensive 2011 regulatory impact analysis), and issued the MATS Rule, imposing technology-based limits on mercury and other hazardous emissions from power plants. 77 Fed. Reg. 9304, 9310–11, 9363–64, 9366–76 (Feb. 16, 2012); MATS RIA. A state coalition intervened to defend EPA's rulemaking in challenges from various groups, including members of the regulated industry. After the D.C. Circuit upheld EPA's 2012 regulation in full, *White Stallion Energy Ctr., LLC v. EPA*, 748 F.3d 1222 (D.C. Cir. 2014) (per curiam), the Supreme Court granted review on a narrow question: whether EPA had improperly failed to consider costs when determining that it was appropriate to regulate hazardous air pollutant emissions from power plants, *Michigan v. EPA*, 135 S. Ct. 2699 (2015). The Supreme Court held that the agency had to consider costs, *id.* at 2712, and on remand EPA reaffirmed the appropriate and necessary finding after weighing both the massive public health and environmental benefits and the costs of regulation. 81 Fed. Reg. 24,420, 24,452 (Apr. 25, 2016). Many of the States and Local Governments again intervened to defend EPA's rulemaking against another round of challenges in a case that is currently in abeyance. *See Murray Energy Corp. v. EPA*, No. 16-1127 (D.C. Cir.).

In 2019, EPA, again, proposed to reverse the appropriate and necessary finding. 84 Fed. Reg. 2,670 (Feb. 7, 2019). Despite comments from many of the States and Local Governments and other parties cautioning that this proposed action was unlawful, EPA finalized its 2020 Action purporting to reverse the appropriate and necessary finding in May 2020, though EPA (unlike in 2005) did leave power plants as a listed source category. 85 Fed. Reg. at 31,289–90. Many of the States and Local Governments, once again, sued the EPA, in a case that is now in abeyance, and also petitioned EPA for reconsideration of that rule in July of 2020. Pet. for Review, *Massachusetts v. EPA*, No. 20-1265 (D.C. Cir. July 20, 2020), Doc. No. 1853575; Attorneys General of Massachusetts, et al., *Pet. for Recons. EPA's Final Rule* (June 21, 2020), Docket No. EPA-HQ-OAR-2018-0794. Many of the States and Local Governments also intervened to defend EPA's regulation of power plants under section 112 as appropriate and necessary in a suit, also currently in abeyance, brought by a coal mining company. *See Westmoreland Mining Holdings, LLC v. EPA*, No. 20-1160 (D.C. Cir.).

On February 9, 2022, EPA published the present Proposal to revoke the 2020 Action, to reaffirm its prior determination that regulating power plant HAP emissions is appropriate and necessary, and to solicit input on the agency's ongoing consideration of its 2020 residual risk and technology review. 87 Fed. Reg. at 7624.

II. EPA Correctly Proposes to Revoke the Unlawful and Unsupportable 2020 Revised Finding.

The States and Local Governments support EPA's proposed revocation of the 2020 Action. That rule was illegal because outside of a statutorily circumscribed process for deregulating under section 112, EPA lacks authority to reverse itself once it determines that regulation of power plant HAP emissions is appropriate and necessary and lists power plants as covered sources. EPA's action was also unlawful and arbitrary and capricious because the agency applied a flawed analytical framework that failed to meaningfully account for key benefits of regulation, giving little or no weight to factors Congress intended that EPA consider, such as unquantified benefits, ancillary co-benefits, effects on the most vulnerable populations, and reliance interests.

A. The 2020 Action Was *Ultra Vires*.

The States and Local Governments urge EPA to acknowledge, as one independent basis for its action, that the 2020 Action was an *ultra vires* exercise of authority. This is a separate ground compelling that rule's recission that EPA should recognize as an additional, independent basis for revocation.

The text, structure, and legislative history of the Clean Air Act confirm that Congress intended EPA to make a time-sensitive threshold decision about whether regulation of power plant HAPs was appropriate and necessary. As the D.C. Circuit made clear in *New Jersey*, once EPA has made an appropriate and necessary finding and listed power plants, the only way (absent a court order)[50] that the agency may reverse course is by invoking section 112(c)(9) and demonstrating that no power plant poses an unacceptably high risk to human health or the environment. 517 F.3d at 583. Because EPA in 2020 sought to revoke its appropriate and necessary finding without using this single statutorily mandated procedure for deregulation—and without a court invalidating the 2016 Supplemental Finding made on remand from *Michigan*—the agency acted beyond its authority and EPA should now disavow its prior attempt to evade the Act's procedures as *ultra vires*. *Cf.* 85 Fed. Reg. at 31,289–92.

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[50] A reviewing court, subject to applicable judicial review procedures, may order EPA to revisit an appropriate and necessary finding by remanding the finding to the agency, as the D.C. Circuit did in 2015 on remand following *Michigan*. *White Stallion II* (D.C. Cir. Dec. 15, 2015) (order remanding the proceeding to EPA without vacatur of the MATS Rule), Doc. ID No. EPA-HQ-OAR-2009-0234-20567; *accord New Jersey*, 517 F.3d at 583 (confirming that "section 112(c)(9)'s delisting process or court-sanctioned vacatur" are the only avenues for deregulating power plants).

Once power plants are listed under section 112 based on a positive appropriate and necessary finding, the statute's plain text unambiguously prohibits EPA from reversing course outside of section 112(c)(9)'s delisting procedures. Enacted as part of the 1990 Clean Air Act Amendments, section 112(n)(1)(A) directed EPA to make an initial finding as to whether power plants should be regulated under section 112, based on a public health study that was due, and in fact completed, decades ago.[51] In the words of the statute, EPA "shall perform a study of the hazards to public health reasonably anticipated to occur as a result of emissions by [power plants]" and report the results of that study to Congress by 1993; and EPA further "shall regulate [power plants] under this section, if the Administrator finds such regulation is appropriate and necessary after considering the results of the study." 42 U.S.C. § 7412(n)(1)(A). As EPA has long recognized, "[o]nce the appropriate and necessary finding is made, EGUs [electric utility steam generating units, or power plants] are subject to section 112 in the same manner as other sources." 77 Fed. Reg. at 9330. Thus, upon finding that it is appropriate and necessary to regulate power plant hazardous air emissions—as EPA did in 2000, and reaffirmed in 2012 and 2016—the agency no longer has discretion to exercise; section 112(n)(1)(A) requires that EPA "shall regulate" power plants. *See Chevron*, 467 U.S. at 843–44 (agencies have discretion "only when Congress has left a gap for the agency to fill"); *Ethyl Corp. v. EPA*, 51 F.3d 1053, 1060 (D.C. Cir. 1995) ("level of specificity" in Clean Air Act provision "effectively closes any gap the Agency seeks to find and fill").

Whether or not EPA later believes its initial determination was made in error, the only regulatory off-ramp Congress provided EPA is section 112(c)(9). Under that provision, titled "[d]eletions from the list," EPA "may delete any source category from the list" of categories regulated under section 112 if EPA can demonstrate that no source in that category poses an unacceptable risk to human health or the environment. Specifically, EPA would have to make two determinations: first, "that no source in the category" emits hazardous air pollution "in quantities which may cause a lifetime risk of cancer greater than one in one million" to the most exposed individual, and, second, "that emissions from no source . . . exceed a level which is adequate to protect public health with an ample margin of safety and no adverse environmental effect will result from emissions from any source." 42 U.S.C. § 7412(c)(9)(B)(i)–(ii). As the D.C. Circuit has confirmed, section 112(c)(9)'s "comprehensive delisting process" unambiguously applies to *all* listed sources, including power plants. *New Jersey*, 517 F.3d at 582–83. And when EPA took the 2020 Action, it did not purport to make the findings necessary to delist power plants. Nor could it have made such findings given, *inter alia*, indisputable record evidence that cancer risks far exceed the delisting threshold.[52] *See* 84 Fed. Reg. at 2697 tbl.5, 2699 (inhalation risk assessment showing estimated maximum individual cancer risks of 9-in-1 million and about 193,000 people with cancer risks above 1-in-1 million).

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[51] *See* EPA, Off. of Air Quality Planning & Standards, *Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units – Final Report to Congress* (1998), Doc. ID No. EPA–HQ–OAR–2009–0234–3052.

[52] Nor could EPA have demonstrated the absence of any adverse environmental effect given the well-established environmental harms of power plant mercury emissions in particular. *See supra* Section I.B.2; *see also, e.g.*, 81 Fed. Reg. at 24,423 (power plant mercury emissions "contribute to adverse impacts on fish-eating birds and mammals"); 65 Fed. Reg. at 79,830 ("[e]xposure to methylmercury can have serious toxicologic effects on wildlife").

Other than the delisting process, Congress did not vest EPA with any authority to "correct flaws" that it might later perceive in its appropriate and necessary determination, including purported flaws arising from new policy preferences or legal interpretations. 85 Fed. Reg. at 31,289; *see also id.* at 31,290 (noting "change in administrations" as a driver of 2020 Action). The reasons that Congress so circumscribed EPA's authority are apparent from the Clean Air Act's history. When enacting the 1990 Clean Air Act Amendments, Congress intended to remedy "the slow pace of EPA's regulation" that had hindered attainment of the Act's pollution-prevention aims. *New Jersey*, 517 F.3d at 578; *see also Air All. Houston v. EPA*, 906 F.3d 1049, 1061–62 (D.C. Cir. 2018) (Congress enacted the Clean Air Act "to encourage and promote 'pollution prevention'" (citing 42 U.S.C. § 7401(c))). Congress viewed EPA's failure to regulate hazardous air pollutants as a "history of abuse and abdication," S. Rep. No. 101-228 (1989), 1990 U.S.C.C.A.N. 3385, 3561, and designed the section 112 amendments to "entirely restructure the existing law, so that toxics might be adequately regulated by the Federal Government," *id.* at 3513. To that end, Congress "altered section 112 by eliminating much of EPA's discretion." *New Jersey*, 517 F.3d at 578; *see also Nat'l Lime Ass'n v. EPA*, 233 F.3d 625, 634 (D.C. Cir. 2000) (Congress "believed EPA had failed to regulate enough [pollutants] under previous air toxics provisions"). For instance, Congress itself listed 189 hazardous air pollutants, including mercury, 42 U.S.C. § 7412(b)(1), gave EPA one year to list all source categories that emitted the listed pollutants, *id.* § 7412(c)(1), and directed EPA promptly to establish emissions standards for those categories, *id.* § 7412(e). And Congress deliberately "restricted the opportunities for EPA and others to intervene in the regulation of HAP sources" by establishing the demanding section 112(c)(9) criteria for removing a listed source category and by barring judicial review of listing decisions until EPA promulgated emission standards for the source category. *New Jersey*, 517 F.3d at 578 (citing 42 U.S.C. § 7412(c)(9), (e)(4)). EPA's determination in the 2020 Action that it retained broad ongoing authority to reverse course flouted Congress's intent to channel and limit the agency's discretion.

Indeed, EPA's attempt in 2020 to rely on purported "inherent authority" to reverse its appropriate and necessary finding, 85 Fed. Reg. at 31,290, unlawfully and unreasonably "construe[d] the statute in a way that completely nullifie[d] textually applicable provisions meant to limit its discretion," *New Jersey*, 517 F.3d at 583 (quoting *Whitman*, 531 U.S. at 485). Courts, including the D.C. Circuit, have routinely struck down agency attempts to rely on "inherent authority" to evade statutory limits on their authority. *See, e.g.*, *Ivy Sports Medicine, LLC v. Burwell*, 767 F.3d 81, 87 (D.C. Cir. 2014) (Kavanaugh, J., op.) (invalidating FDA order because "it would be unreasonable under this statutory scheme to infer that FDA retains inherent authority to short-circuit or end-run the carefully prescribed statutory reclassification process"); *see also New Jersey*, 517 F.3d at 583 ("Congress . . . undoubtedly can limit an agency's discretion to reverse itself"); *American Methyl*, 749 F.2d at 835 ("when Congress has provided a mechanism capable of rectifying mistaken actions . . . it is not reasonable to infer authority to reconsider agency action").[53] And in *New Jersey*, the D.C. Circuit specifically rejected EPA's

[53] *Cf. Air All. Houston*, 906 F.3d at 1061 (EPA "may not circumvent specific statutory limits on its actions by relying on separate, general rulemaking authority"); *Humane Soc'y of United States v. Zinke*, 865 F.3d 585, 601–02 (D.C. Cir. 2017) (segmentation of listed species unlawful where, *inter alia*, Fish and Wildlife Service failed to analyze effect of segmentation on remnant's status, as omitting such analysis would turn segmentation into "a backdoor route to the *de*

attempt to claim "inherent authority" as a basis for unwinding regulation of power plant HAPs, explaining that Congress "can limit an agency's discretion to reverse itself, and in section 112(c)(9) Congress did just that," thereby "preclud[ing] EPA's [assertion of] inherent authority" to reverse course on its predicate regulatory determinations.

Congress commonly designs statutes to prevent an agency from deregulatory "backsliding" by eliminating or restricting an agency's authority to undo regulatory determinations and/or to loosen the stringency of regulations once such determinations have been made. For example, the Energy Policy and Conservation Act "prohibits DOE from promulgating an amended [energy conservation] standard that is less stringent than the preexisting standard." *Nat. Res. Def. Council v. Perry*, 940 F.3d 1072, 1075 (9th Cir. 2019). Section 172(e) of the Clean Air Act "protects against backsliding" by barring EPA from relaxing the stringency of controls for nonattainment areas even if the agency loosens an ambient air quality standard. *See S. Coast Air Quality Mgmt. Dist. v. EPA*, 472 F.3d 882 (D.C. Cir. 2006). And the National Highway Traffic Safety Administration (NHTSA), in administering the Corporate Average Fuel Economy (CAFE) standards program, has statutory authority to increase the amount of the penalty imposed on automakers that violate the standards, but no countervailing statutory authority to ratchet down the amount once it has been increased. 49 U.S.C. § 32912(c) (authorizing NHTSA to make discretionary increases to CAFE penalty amount); 28 U.S.C. § 2461 note § 3 (directing NHTSA and other federal agencies to increase penalties for inflation); *see New York v. Nat'l Highway Traffic Safety Admin.*, 974 F.3d 87, 100 (2d Cir. 2020) (holding that NHTSA had to follow "highly circumscribed schedule" to implement penalty increases and lacked freestanding authority to reverse a penalty increase once made). The scheme for regulating power plants under section 112 operates in a similar fashion to these other programs, constraining agency power to unwind certain regulatory determinations designed to protect public health and the environment, except in accordance with specifically enumerated statutory limits and procedures.

Because EPA in 2020 attempted to revoke the regulatory basis for the MATS Rule without following the statutory delisting procedures, the 2020 Action was not authorized by statute and was *ultra vires*. EPA should recognize as much and should ground its revocation of the 2020 Action on that additional and independent basis.

B. EPA Correctly Recognizes that the 2020 Action Should Be Revoked Because that Action Relied on a Flawed Methodology.

Regardless of EPA's authority to rescind an affirmative appropriate and necessary finding once made, the States and Local Governments support EPA's Proposal to revoke the 2020 Action on the ground that its 2020 methodology "was an approach ill-suited to making the appropriate and necessary determination." 87 Fed. Reg. at 7659. EPA's Proposal correctly recognizes that the approach taken in 2020 "places undue primacy on those HAP benefits that have been monetized, . . . fails to consider critical aspects of the" statutory framework under section 112(n)(1), and generally lacks sufficient justification. *Id.* at 7660. Furthermore, EPA's

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facto delisting of already-listed species, in open defiance of the Endangered Species Act's specifically enumerated requirements for delisting").

2020 Action was arbitrary and capricious because it failed to account for reliance interests of the States and other actors.

1. EPA's 2020 Analysis Improperly Devalued the MATS Rule's Vast Array of Unquantified Benefits.

EPA's analysis in the 2020 Action failed to give meaningful weight to the multitude of unquantified benefits stemming from the HAP reductions achieved by the MATS Rule. As the first (and ultimately dispositive) step in its 2020 approach, EPA directly weighed the full monetized costs of the MATS Rule (estimated to be several billion dollars) against the single subset of benefits that the agency was then able to monetize (estimated to be about $5 million)—consisting only of IQ loss in children born to a subset of recreational fishers who consume fish while pregnant. That direct comparison was used as the benchmark that would control the agency's appropriate and necessary determination unless the agency, in subsequent steps, found a basis to believe that either the unquantified benefits of reducing HAPs or the ancillary benefits of reducing criteria pollutants were of sufficient weight to disturb its initial calculation. EPA then cursorily determined that unquantified benefits were "not likely to overcome the imbalance" between monetized costs and monetized benefits. 85 Fed. Reg. at 31,296.

By hinging its comparative benefit-cost analysis so predominantly on the single HAP benefit it could most easily monetize, and by giving short shrift to the unquantified benefits that comprised the majority of the actual HAP-related benefits of the MATS Rule, EPA impermissibly narrowed the proper focus of section 112. *See Michigan*, 135 S. Ct. at 2709 (noting that section 112(n)(1)(A)'s "broad reference to appropriateness encompasses *multiple* relevant factors"). The 2020 Action essentially gave no weight to the more than *sixty* distinct categories of unquantified health, environmental, and economic benefits that had previously been identified in the MATS RIA—contravening Congress's clear intent that EPA carefully analyze health hazards posed by power plant hazardous emissions. *See* 42 U.S.C. § 7412(n)(1)(A) (directing EPA to regulate after considering its study of health hazards reasonably anticipated to result from power plant hazardous emissions).

As EPA has long recognized, a great number of the benefits from regulation are difficult (or impossible) to quantify or assign monetary value, and where such quantification is not yet possible, such benefits should still be assessed qualitatively in a way that ensures they remain central to the analysis.[54] *See supra* at 10-12; *infra* at 26–27. In the MATS context, such unquantified benefits have included, for example, the fact that prenatal exposure to even low levels of mercury can cause serious harms limiting children's ability to learn and achieve, including by impairing their attention, fine motor function, language skills, visual-spatial abilities, and verbal memory. 76 Fed. Reg. at 25,018; *see also* 65 Fed. Reg. at 79,829. Those harms impose lifelong costs that are difficult to quantify. *See* 77 Fed. Reg. at 9353 (explaining that because IQ is "not the most sensitive neurodevelopmental endpoint affected by [methylmercury] exposure" reliance on IQ "underestimates the impact of reducing methylmercury in water bodies"); MATS RIA at 4-65. Similarly, a variety of other health

[54] *See, e.g.*, 77 Fed. Reg. at 9306 (noting "limitations and uncertainties" of monetary figures); MATS RIA at 4-2 (discussing uncertainty and concluding that mercury benefits were likely underestimated due to data limitations); *id.* at ES-9 to ES-13 (describing the particular difficulty in quantifying mercury-related neurologic, cardiovascular, genotoxic, and immunologic damage to humans and reproductive harm to fish, birds, and mammals).

conditions have not been quantified, such as cancer risks and adverse neurological, cardiovascular, immunological, reproductive, liver, kidney, and respiratory effects. 76 Fed. Reg. at 25,003; MATS RIA at 4-68 to 4-73. Nor has EPA quantified, for example, the benefits of the MATS standards in fostering the ability of many historically overburdened communities to maintain traditional ways of life based on subsistence fishing. *See infra* at 27–28.

EPA's minimization of the overwhelming bulk of benefits that were not yet capable of being monetized is contrary to the specific concern Congress expressed about mercury harms, including from power plant mercury emissions. *See* 42 U.S.C. § 7412(c)(6) (prioritizing development of non-power-plant standards for certain persistent pollutants, including mercury); *id.* § 7412(n)(1)(B), (C) (requiring study of mercury emissions, including from power plants, and health risks); S. Rep. No. 101-228, 1990 U.S.C.C.A.N. at 3515 (noting widespread contamination of fish in northern lakes "attributable to mercury emissions from coal-fired power plants"). That approach is also contrary to Congress's plain understanding that the potential harms of hazardous air pollutants would be extremely difficult to quantify in time for an appropriate and necessary determination, as assessments of those harms would instead become clearer over years and decades—more time than EPA would have to determine whether to list power plants and to set standards. *See Portland Cement Ass'n v. Ruckelshaus*, 486 F.2d 375, 387 (D.C. Cir. 1973) (rejecting argument that section 111(a) requires quantified benefit-cost analysis in part because of "the specific time constraints" imposed by Congress for listing sources and setting standards); Richard L. Revesz, *Quantifying Environmental Benefits*, 102 Cal. L. Rev. 1423, 1436 (2014) (noting that some of the most important categories of benefits of environmental regulation that were once considered unquantifiable have subsequently been quantified); *see also infra* at 26-27.

EPA's present analysis confirms the importance of benefits that were unquantified in 2020. By using more up-to-date science, EPA is now able to provide estimates of certain benefits that had previously been unquantified, such as the cardiovascular benefits of reductions in mercury. *See infra* Section III.B.2. These benefits, unsurprisingly, are substantial. In fact, they drastically increase the monetized estimate of quantifiable benefits *more than a hundredfold*. *See id*. The States and Local Governments thus support EPA's current determination that the 2020 Action unjustifiably "discount[ed] the social value (benefit)" of numerous impacts "simply because the Agency c[ould]not assign a dollar value to those impacts." 87 Fed. Reg. at 7660.

2. EPA's 2020 Analysis Failed to Properly Consider the Massive Benefits of the MATS Rule in Reducing Emissions of Particulate Matter and Sulfur Dioxide.

EPA also failed in 2020 to meaningfully account for the extensive reductions in harmful particulate matter and sulfur dioxide attributable to the MATS Rule. The predicted benefits of the MATS Rule for particulate matter reductions alone, for example, included an estimated 4,200 to 11,000 avoided premature deaths; 2,800 fewer cases of chronic bronchitis; 4,700 fewer non-fatal heart attacks; 830 fewer hospital admissions for respiratory symptoms; 1,800 fewer hospital admissions for cardiovascular symptoms; 540,000 fewer lost work days; and 3,200,000 fewer minor restricted activity days in adults. 77 Fed. Reg. at 9306; MATS RIA at 5-95. And even though EPA was unable to quantify all categories of co-benefits associated with reductions in sulfur dioxide and fine particulate matter (notably ecosystem and visibility effects), its estimates of the monetized benefits were massive, ranging from $59 billion to $140 billion. 76 Fed. Reg. at 25,085.

It defied common sense for EPA, after finding an inflated estimate of monetized costs to substantially exceed the small sliver of HAP-related benefits that had been monetized, to essentially disregard the extensive co-benefits that had been quantified and monetized and that, if properly considered, would weigh even further in favor of regulation. First, section 112(n)(1)(A) itself reflects a congressional intent that such "co-benefits" be a part of regulatory decisionmaking; that provision directs the agency, in making the appropriate and necessary determination, to consider the how the regulation of sulfur dioxide and nitrogen oxides under other Clean Air Act programs would lead to HAP reductions. *See* 80 Fed. Reg. 75,025, 75,041 (Dec. 1, 2015). Thus, section 112 plainly demonstrates that Congress understood the interplay between different regulatory schemes and intended for EPA to holistically account for environmental co-benefits under the Act's interrelated procedures. Second, the co-benefits of the MATS Rule are a direct consequence of the emission controls required by MATS. Because the acid gases, selenium, and ionic mercury regulated under section 112 are readily captured by technologies that are typically used to control sulfur dioxide, sources are using those very sulfur dioxide control technologies as a means of complying with the MATS Rule.[55] And reducing emissions of hazardous non-mercury metals necessarily results in reductions of particulate matter because those toxic metals normally are found in particles and, like particle-bound mercury, are captured by removing the filterable particulate matter emitted by power plants. 80 Fed. Reg. at 75,041. Third, EPA's attempt to ignore ancillary *benefits* on the basis that they are "indirect" cannot be squared with the agency's determination in 2020 to consider ancillary *costs* in its rulemaking—for example, the knock-on costs of the MATS Rule to the power sector and to consumers beyond the direct compliance costs of installing pollution controls. Nor can EPA's disregard of "indirect benefits" be squared with the Supreme Court's direction in *Michigan*, 135 S. Ct. at 2707, that the agency should not blind itself to all of the effects of regulation, including, for example, indirect effects such as unintended "harms that regulation might do to human health or the environment." Just as indirect harms must be considered, so too must indirect benefits.

While the States and Local Governments agree that the appropriate and necessary determination is supported even without looking to ancillary benefits, EPA's failure to consider this massive set of benefits in concluding that regulation was not appropriate is another reason its 2020 Rule was illegal.

3. EPA's Framework in 2020 Failed to Give Meaningful Weight to the Benefits Accruing to Historically Marginalized and Overburdened Populations, a Touchstone of Section 112.

The States and Local Governments also fully support EPA's present recognition that its 2020 approach was illegal because it failed to adhere to Congress's clear intent to reduce exposures to historically marginalized and overburdened populations, notably including the

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[55] NESCAUM, *Control Technologies to Reduce Conventional and Hazardous Air Pollutants from Coal-Fired Power Plants*, 23–24 (2011), https://www.nescaum.org/documents/coal-control-technology-nescaum-report-20110330.pdf/; *see also id.* at 13, 22 (noting that injection of dry sorbent reagents that react with acid gases (DSI), combined with downstream particulate matter control device to capture reaction products, can remove ninety percent of sulfur dioxide and ninety-eight percent of hydrochloric acid (regulated under section 112) present in power plant emissions). The MATS Rule thus targets fine particulate matter and sulfur dioxide as surrogates for certain hazardous air pollutants. *See* 81 Fed. Reg. at 24,438 n.29.

"most exposed and most sensitive subpopulations." 87 Fed. Reg. at 7660. EPA's 2020 analysis was arbitrary because it failed to account for that critical "relevant factor." *See Michigan*, 135 S. Ct. at 2709.

The text and structure of the statute codify the concern for protecting the most vulnerable individuals through, for example, the residual risk review provision, which directs EPA to promulgate standards if even a single individual has a cancer risk exceeding a one-in-one-million threshold. 42 U.S.C. § 7412(f)(2)(A). Likewise, section 112's circumscribed procedures for delisting sources and deleting regulated substances allow EPA to deregulate only under the narrowest circumstances: where substances are determined to have no adverse health or environmental effects, or where source categories do not cause any individual's lifetime cancer risk to exceed one-in-one-million. *Id.* § 7412(c)(9)(B)(i). The legislative history to the 1990 Amendments further demonstrates Congress's concern with the lifetime cancer risk to the most exposed individuals, by recognizing the synergistic effects on such individuals of multiple direct and indirect pathways of exposure to toxic pollutants. H.R. Rep. No. 101-190, at 315. These provisions collectively illustrate Congress's concern with protecting individuals in the most exposed and vulnerable communities, which are often the same communities that have been historically marginalized and overburdened. Yet despite these clear indications of Congress's concern that regulation be designed to eliminate even low levels of risk to the most exposed and sensitive persons in such communities, the framework adopted in 2020 centering on a direct comparison of costs to monetized benefits unlawfully and arbitrarily gave no weight to these impacts, as EPA now appropriately acknowledges. *See* 87 Fed. Reg. at 7660.

4. EPA's Failure in 2020 to Consider Reliance Interests Is Another Basis for Rescinding the 2020 Action.

Another independent ground for revoking the 2020 Action is the agency's failure to properly account for reliance interests. When an agency changes regulatory policy, it is "required to assess whether there [a]re reliance interests, determine whether they [a]re significant, and weigh any such interests against competing policy concerns." *Dep't of Homeland Sec. v. Regents of the Univ. of Cal.*, 140 S. Ct. 1891, 1915 (2020). EPA failed to do so in the 2020 Action.

As many of the States and Local Governments anticipated when commenting on the proposal preceding EPA's 2020 Action, it was foreseeable that opponents of the MATS Rule would seek to leverage EPA's 2020 determination to request that a court invalidate the MATS emissions standards that were predicated on the affirmative appropriate and necessary finding. And indeed, after the 2020 Action was promulgated, such a challenge was brought in the D.C. Circuit. *Westmoreland Mining Holdings LLC v. EPA*, No. 20-1160 (D.C. Cir.), Doc. No. 1857810 (challenger's statement of issues). Yet EPA entirely failed to consider the risks posed by such a lawsuit, including the potential health, environmental, and economic consequences to States and Local Governments if the MATS emissions controls were no longer required.[56]

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[56] In the absence of enforceable emission standards, power plants would be unlikely to operate their HAP controls, leading to an enormous increase in HAP and criteria pollutants and wiping out the myriad health and environmental gains attributed to the MATS Rule, *supra* Section I.B.1, with particularly severe effects for vulnerable and sensitive subgroups, *supra* at 5–7, and with substantial economic impacts imposed on, *inter alia*, state fisheries, *supra* Section I.B.2.

Of note, EPA's 2020 Action threatened to undermine a wide variety of state planning, as certain states depend on the MATS Rule to meet TMDL goals, to develop strategies to attain and maintain ambient air quality standards, and to achieve reasonable progress goals under regional haze plans. *See supra* Section I.B.3. EPA also failed to consider the reliance interests of electricity customers, who might be forced to continue to bear the costs of controls that power plant owners and operators had turned off. Nor did EPA consider reliance interests of utilities that had made the substantial capital expenditures required by the MATS Rule and that might, in the absence of an affirmative appropriate and necessary finding, be unable to recover from ratepayers some or all of their investments if deemed imprudent by a public utility commission. EPA now recognizes the existence of these many "aligned" reliance interests, 87 Fed. Reg. at 7668, and it should acknowledge that its failure to account for them in the 2020 Action is yet another ground for that rule's rescission.

III. EPA's Approach to Affirming the Supplemental Finding Lawfully and Faithfully Comports with Congress's Intent and the Supreme Court's Direction in *Michigan*, and the Record Supports EPA's Conclusion under that Approach.

EPA's totality of the circumstances approach is faithful to the Clean Air Act's text and purpose, carefully evaluates the relevant statutory considerations, and rectifies flaws in the agency's 2020 analysis. *See* 87 Fed. Reg. at 7627. Moreover, abundant record evidence supports EPA's determination that regulation of power plant HAP emissions remains appropriate and necessary under this framework. And this is so, as EPA correctly finds, on both the original record previously before the agency as well as an updated record that accounts for more recent evidence on benefits and costs. In fact, even the updated record offers a conservative accounting of the justification for regulation, as additional evidence demonstrates that benefits are even higher and costs lower than EPA presently estimates.

A. EPA's Totality of the Circumstances Approach is Rational and Best Effectuates the Statute's Goals and Intent.

In its proposed totality of the circumstances approach, EPA carefully considers and weighs all statutorily relevant factors to determine whether to regulate hazardous air pollution from power plants. 87 Fed. Reg. at 7668. Taking its cue from Congress's focus on public health in section 112(n)(1)(A), EPA begins by considering the human health advantages. *Id.* at 7637–48. This analysis looks to the direct, quantified as well as unquantified, health effects of regulating hazardous air pollutants from power plants. *See id.* EPA pays particular attention to the distribution of the benefits of such regulation and how they affect the populations most exposed and most vulnerable to the health impacts of air pollutants. *See id.* Next, EPA, considers the environmental benefits to society of regulating hazardous air pollutant emissions from power plants, *id.* at 7640–41, 7647–48, as well as the overall volume of emissions of hazardous air pollutants from power plants, *see id.* at 7662 (citing 42 U.S.C. § 7412(n)(1)(B)). EPA then carefully considers, under several different contextual metrics, the varied costs of such regulation, including both the direct costs of compliance as well as the broader costs to society, such as potential increases in retail electricity prices associated with regulation and potential reductions in the reliability of electricity service. *See* 87 Fed. Reg. at 7628, 7663, 7666–68. Finally, EPA "proposes to conclude that the substantial benefits of reducing HAP from EGUs, which accrue in particular to the most vulnerable members of society, are worth the costs," and that, "after weighing the totality of the circumstances, . . . regulation of HAP from [power plants] is appropriate." *Id.* at 7668.

EPA's totality of the circumstances approach is not only "rationally related to the goals of the statute," *Good Fortune Shipping SA v. Comm'r of Internal Revenue Serv.*, 897 F.3d 256, 261 (D.C. Cir. 2018) (internal quotation marks omitted), but it is also the best effectuation of Congress's intent. As EPA thoroughly explains in its Proposal, the totality of the circumstances approach to the section 112(n)(1)(A) determination aligns with the text and structure of the provision and furthers the statute's purposes. *See* 87 Fed. Reg. at 7662–69; *cf. Spectrum Pharms., Inc. v. Burwell*, 824 F.3d 1062, 1067 (D.C. Cir. 2016) (upholding agency application of governing statute that "closely hews to the [statute's] text" and "conforms to the statutory purposes").

1. EPA's Totality of the Circumstances Approach is the Best Approach to Faithfully Consider the Factors Congress Deemed Important.

The language and context of section 112's appropriate and necessary determination indicate that EPA ought to account for the many relevant potential benefits of HAP regulation when making the finding. The totality of the circumstances approach is well-suited to carrying out this directive. First and foremost, this approach allows EPA to effectively prioritize the public health implications of regulating hazardous air pollution from power plants. Second, it allows EPA to consider other statutory factors that Congress highlighted, including critical considerations that other analytical approaches might overlook, such as the distributional and cumulative impact of hazardous air pollutants on overburdened and marginalized communities.

As the Supreme Court instructed, "'appropriate' is 'the classic broad and all-encompassing term that naturally and traditionally includes consideration of all the relevant factors.'" *Michigan*, 576 U.S. at 751 (quoting *White Stallion Energy Ctr., LLC*, 748 F.3d at 1266 (Kavanaugh, J., dissenting)). It is thus eminently reasonable for EPA to make the appropriate and necessary determination by balancing a broad swath of considerations that Congress has indicated are relevant to this section's goals, including public health, health impacts on the most vulnerable and exposed individuals, environmental effects, and costs. Indeed, courts have routinely blessed agency uses of a totality of the circumstances approach in analogous statutory contexts. *See Catawba Cty. v. EPA*, 571 F.3d 20, 39 (D.C. Cir. 2009) (holding that agency may "adopt a totality-of-the-circumstances test to implement a statute that confers broad authority"); *Chippewa & Flambeau Imp. Co. v. FERC*, 325 F.3d 353, 358–59 (D.C. Cir. 2003) (holding that Congress granted FERC significant discretion "by enacting [a] 'necessary or appropriate' standard" and that FERC's "case-by-case approach" to making that determination based on a "series of relevant factors" was reasonable and consistent with the governing statute). Many of the undersigned States have also adopted similarly wide-ranging analytical frameworks that account for all relevant factors when enacting their own regulatory standards to address certain hazardous (and other) air pollutant emissions from power plants.[57]

The States and Local Governments support EPA's decision under a totality of the circumstances approach to prioritize all of the public health benefits of regulating hazardous air

[57] For example, in 2006, Delaware established regulations to reduce emissions of nitrogen oxides, sulfur dioxide, and mercury from power plants to "reduce the impact of those emissions

pollution from power plants, whether capable of quantification or not, in line with Congress's clear intent. *See* 87 Fed. Reg. at 7637–48. While Congress did not define the precise methodology that EPA is to employ when making an appropriate and necessary determination, 42 U.S.C. § 7412(n)(1)(A), it clearly communicated that EPA should focus on the "hazards to public health . . . as a result of emissions" from power plants, explicitly directing EPA to conduct a formal study on that issue to inform its determination, 87 Fed. Reg. at 7662 (citing 42 U.S.C. § 7412(n)(1)(A)).

The other studies that Congress authorized EPA to conduct in section 112(n) further indicate Congress's intent that EPA pay careful attention to the multiple insidious harms of hazardous air pollution from power plants; Congress directed the agency to study and consider: the "health and environmental effects of such emissions," 42 U.S.C. § 7412(n)(1)(B); the amount ("rate and mass") of those emissions, *id.*; and the health risks of even low levels of mercury to sensitive populations, *id.* § 7412(n)(1)(C). And, as EPA details in its Proposal, other references in section 112 highlight Congress' concern that EPA exercise its section 112 authority to address even small health and environmental risks posed by hazardous air pollutants. *See, e.g.*, *id.* § 7412(b)(3)(D) (prohibiting deletion of substance from regulated list unless data show that "the substance may not reasonably be anticipated to cause *any* adverse effects to human health or adverse environmental effects" (emphasis added)).

Additionally, EPA's totality of the circumstances approach allows the agency to consider, as instructed by Congress, the distributional and cumulative impact of HAPs on already overburdened and marginalized communities. A more linear balancing of costs against general societal benefits would not capture these impacts. As EPA details in its Proposal, section 112 "is drafted in order to be protective of small cohorts of highly exposed and susceptible populations." 87 Fed. Reg. at 7666. For example, Congress instructed the agency to account for the most vulnerable communities and persons by directing it to evaluate the "threshold level of mercury exposure below which adverse human health effects are not expected to occur," specifically by taking into account consumption of fish tissue by "sensitive populations." 42 U.S.C. § 7412(n)(1)(C). And the residual risk assessment that Congress requires in section 112(f)—mandating that the agency promulgate regulations if even a single person exceeds a threshold cancer risk level—indicates Congress' intention that regulations under section 112 not only reduce overall pollution, but limit health risks to the most vulnerable and exposed individuals. *See id.* § 7412(f)(2) (requiring EPA to impose further regulations if existing standards for

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on public health," help the state meet attain National Ambient Air Quality Standards (NAAQS), help reduce particulate and mercury pollution related to coal and oil-fired power plants, satisfy the state's obligations under federal rules, and "improve visibility" and reduce "EGU-related regional haze." Del. Admin. Code tit. 7 § 1146, Electric Generating Unit (EGU) Multi-Pollutant Regulation (Dec. 2006), https://regulations.delaware.gov/AdminCode/title7/1000/1100/1146.pdf. Similarly, the Maryland Department of the Environment, when assessing air pollutant regulations for fossil-fuel burning power plants, evaluated the impacts of such regulation on compliance with federal standards, public health and welfare, pollution in the Chesapeake Bay, and vegetation and agriculture. *See* Md. Dep't of the Env't, Technical Support Document for Proposed COMAR 26.11.38 (May 26, 2015), https://mde.maryland.gov/programs/Regulations/air/Documents/TSD_Phase1_with_Appendix.pdf.

particular source of pollution fail to reduce "lifetime excess cancer risks to the individual most exposed to" emissions from that source below one in one million).

If EPA were to evaluate whether to regulate HAP emissions from power plants by comparing quantified costs and benefits on an aggregate, societal level, as the agency did in 2020, it would ignore Congress' directive to consider impacts on specific vulnerable populations. *See supra* Section II.B.3. In contrast, by adopting a totality of the circumstances approach to the 112(n)(1) inquiry, EPA is able to weigh critical fact-specific data on that score, such as evidence that Black subsistence fisher women in the Southeast face disproportionately high levels of mercury exposure carrying a risk of prenatal neurodevelopmental harm. *See* 87 Fed. Reg. at 7647; *cf. PDK Lab'ys Inc. v. U.S. Drug Enf't Admin.*, 438 F.3d 1184, 1194 (D.C. Cir. 2006) (affirming appropriateness of totality of the circumstances approach to make "fact-intensive determinations").

In sum, EPA's totality of the circumstances approach best allows the agency to evaluate the full range of benefits of power plant HAP regulation that Congress deemed relevant to the appropriate and necessary determination.

2. EPA Appropriately Considers Unquantified Benefits and Co-Benefits as Part of its Totality of the Circumstances Analysis.

EPA's totality of the circumstances approach, unlike the approach taken in the 2020 Action, sensibly recognizes and accounts for those benefits that Congress required EPA to consider—health related and otherwise—that are unquantifiable or as-yet unquantified. Indeed, OMB has long cautioned agencies against "ignoring unquantifiable benefits, because the most efficient rule may not have the "largest quantified and monetized . . . estimate," Office of Mgmt. & Budget, Circular A-4, at 2 (2003), and directed agencies to consider values that are difficult or impossible to quantify, including equity, human dignity, fairness, and distributive impacts, Exec. Order No. 13,563 § 1, 76 Fed. Reg. 3821, 3821 (Jan. 21, 2011) (affirming Exec. Order No. 12,866). *See also Exec.* Order No. 12,866 § 1, 58 Fed. Reg. 51,735 (Sept. 30, 1993) ("Costs and benefits shall be understood to include both quantifiable measures . . . and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider.").[58] In this context, for example, a direct comparison of costs to social benefits fails to account for the impact of HAPs in threatening the traditional lifestyle of subsistence fishers.

Even for benefits where quantification is at least theoretically possible, EPA accurately recognizes that it can be extremely difficult and time-consuming to quantitatively estimate the manifold health and environmental benefits of reducing emissions of air toxics. 87 Fed. Reg. at 7645. Among other reasons, it is difficult to design population-based epidemiological studies, limited data exist that monitor ambient air pollutant concentrations and individual exposure, insufficient economic research exists that would permit analysts to monetize the health impacts

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[58] *See, e.g.*, 87 Fed. Reg. 10,805–02, 10,812 (describing how FEMA must account for co-benefits that "may not be quantifiable" related to "disadvantaged communities; cultural, historic, and sacred sites; and subsistence-related resources and activities" when evaluating grants); 69 Fed. Reg. 38,958, 39,138–39 (June 29, 2004) (evaluating all effects of regulating emissions from non-road diesel engines and "not just those benefits and costs which could be expressed [] in dollar terms"); 64 Fed. Reg. 52,828, 53,023 (Sept. 30, 1999) (considering the "real, but unquantifiable, benefits" of section 112 standards for hazardous waste combustors).

associated with exposure to air toxics, logistical and ethical barriers make it difficult to conduct controlled scientific studies on the impacts of HAP exposures, and the effects of HAP exposures are dispersed less evenly than other types of impacts that are analyzed epidemiologically. *See id*. For these and other reasons, EPA remains unable to quantify, let alone monetize, anywhere near the full scope of benefits that accrue from regulation of hazardous air pollutants from power plants, including the prevention of myriad health effects like cognitive impairment, cancer, and adverse reproductive effects. The totality of the circumstances approach more effectively captures these unquantified or unquantifiable benefits than one that simply weighs monetized costs against those benefits that may currently be quantified.

In addition, while the States and Local Governments agree with EPA that the appropriate and necessary finding is lawful and supported on the basis of direct benefits alone, *see* 87 Fed. Reg. at 7668, EPA also can and should consider co-benefits of the MATS Rule,[59] as it does here as part of the totality of the circumstances framework. As discussed above, *supra* at 20–21, the co-benefits of the MATS rule include massive health and environmental benefits due to reductions in particulate matter and sulfur dioxide pollution attributable to the MATS controls.[60] 87 Fed. Reg. at 7668–69.

As the States and Local Governments have consistently articulated, *see, e.g.*, Comments of the Attorneys General of Massachusetts et al. ("2019 States' Comments"), Doc. ID No. EPA-HQ-OAR-2018-0794-1175, at 34–37 (Apr. 17, 2019), and as explained in more detail above, *supra* Sections II.B.1 and II.B.2, multiple elements of the Clean Air Act's text and structure show that Congress intended that EPA take a comprehensive view of regulation's advantages and disadvantages when evaluating its appropriateness, including the full scope of its benefits. Notably, section 112(n)(1)(A)'s direction that EPA assess how effectively control technologies targeting other pollutants, under other provisions of the Act, were controlling hazardous air pollution from power plants, demonstrates that Congress did not intend that EPA take a blinkered view of benefits when regulating under section 112. That is especially true where, as here, doing so would give no weight to reductions in particulate matter and other pollutants that have led to massive public health benefits to the States and Local Governments and their residents.

Moreover, these benefits accrue to some of the same sensitive and highly exposed populations most at risk of adverse health effects from HAPs,[61] and there is no reason to believe that Congress's concern about protecting sensitive populations from adverse health impacts extends to some pollutants but not others. *See supra* Section II.B.2. Indeed, before taking its aberrant position in 2020, EPA itself maintained that the co-benefits from reduced emissions of other pollutants associated with HAP regulation were an important part of the agency's determination. Courts have also agreed in other contexts that "considering co-benefits . . . is consistent with the [Clean Air Act]'s purpose—to reduce the health and environmental impacts

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[59] Nonetheless, the States support EPA's decision to analyze the totality of the circumstances both with and without consideration of co-benefits.

[60] These benefits include "decreased risk of premature mortality among adults, and reduced incidence of lung cancer, new onset asthma, exacerbated asthma, and other respiratory and cardiovascular diseases." 87 Fed. Reg. at 7669.

[61] *See* MATS RIA at 7-36 to 7-37; *see also infra* at 30–31 (summarizing co-benefits in MATS RIA).

of hazardous air pollutants." *U.S. Sugar Corp. v. EPA*, 830 F.3d 579, 623–25 (D.C. Cir. 2016) (affirming EPA's reliance on co-benefits, including "reductions in emissions of other pollutants," to justify more stringent standards for hydrogen chloride emissions from boilers, process heaters, and incinerators).

3. EPA's Focus on Sensitive and Vulnerable Populations Aligns with Important Federal and State Environmental Justice Policies.

The States and Local Governments commend EPA for focusing on the disproportionate burden of hazardous air pollution on the communities most sensitive and vulnerable to its impacts. This focus is not only required by the statute, *see supra* at 21–22, 25-26, but also furthers environmental justice policies that the federal government and the undersigned States have deemed critical in a wide range of contexts. For example, Executive Order 14,008 instructed EPA to "secure environmental justice . . . for disadvantaged communities that have been historically marginalized and overburdened by pollution and underinvestment in housing, transportation, water and wastewater infrastructure, and health care" by "address[ing] the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities" in its "programs, policies, and activities." Exec. Order 14,008 § 219, 86 Fed. Reg. 7,619, 7,629–32 (Feb. 1, 2021). Likewise, many of the undersigned States have declared their own commitment to promoting environmental justice through an array of different laws and policies.[62]

The totality of the circumstances analysis allows EPA to give adequate weight to the cumulative impact of HAP emissions on disadvantaged communities that already face disproportionate burdens in housing, transportation, infrastructure, and health care. The States

[62] *See, e.g.*, Cal. Pub. Res. Code § 71113 (establishing working group on environmental justice); S. 2408, 102nd Gen. Assemb. (Ill. 2021) (requiring expedited emissions reductions of power plants operating near designated "environmental justice" and "equity investment eligible" communities and requiring meaningful participation to "protect[] and improve[] the well-being of communities . . . that bear disproportionate burdens imposed by environmental pollution"); 2021 Mass. Acts ch. 8 (incorporating environmental justice principles into Massachusetts climate policy); Mich. Exec. Order No. 2019-06 (establishing Interagency Environmental Justice Response Team); Minn. Pollution Control Agency, *Admin. Policy no. i-admin8-29* (Nov. 2020), (announcing policy to protect "[c]ommunities of color, indigenous communities, and low-income residents" and to "reverse generations of environmental inequities"); S. 232, 2020–2021 Sess. (N.J. 2020) (addressing "the environmental and public health impacts of certain facilities on overburdened communities"); N.C. Exec. Order No. 80 (2018) (requiring cabinet agencies to develop climate adaptation and resiliency plans that "support communities and sectors of the economy that are vulnerable to the effects of climate change"); Or. Admin. R. 182.538 (creating Environmental Justice Task Force); H. 8036, Jan. Sess. (R.I. 2022) ("Environmental Justice Act" requiring, among other things, permitting decision-making to consider cumulative impacts in overburdened areas).

commend EPA for considering the totality of burdens exacerbating health inequities and environmental injustice when making the appropriate and necessary determination.

4. EPA Appropriately Evaluates Costs Holistically.

On the other side of the ledger, EPA's methods of evaluating the costs of regulation are an effective means of paying "attention to . . . the disadvantages of [its] decision[]." 576 U.S. at 753. As the Supreme Court directed, EPA considers the costs of regulation, and the "cost of compliance" in particular, *id.* at 759, when assessing the appropriateness of regulating power plant HAP emissions. *See* 87 Fed. Reg. at 7648–59. EPA proposes to do this not simply by tallying estimated costs to generate a single numerical figure that can be weighed against benefits, but by conducting detailed analyses to contextualize the costs of EGU regulation along different axes.

The States and Local Governments support this holistic approach to assessing costs as part of the totality of the circumstances analysis. Indeed, this approach is especially apt here, where Congress has emphasized its concern with various types of benefits that cannot be translated into simple dollar figures, such as the distribution of regulation's benefits and the impacts on particularly vulnerable segments of society. *See supra* Section II.B.3. Understanding whether these types of benefits are worth the costs necessarily requires an inquiry into the reasonableness of imposing costs separate and apart from a simple comparison of monetized figures. *See* 87 Fed. Reg. at 7659.

The metrics EPA uses to assess costs all fit this bill as reasonable methods of placing costs in context. For example, EPA analyzes projected capital costs of compliance with MATS in the context of the power sector's overall annual capital expenditures. *See id.* at 7657. Such a comparison demonstrates that the investments required to comply with HAP regulations "would comprise a small percentage of the sector's historical annual capital expenditures . . . and also would fall within the range of historical variability in such capital expenditures." *Id.* at 7659. Similarly, EPA analyzes the impact of EGU regulation on retail electricity prices as well as the overall reliability of electricity supply for consumers. *Id.* at 7657–58. These contextualized analyses of the costs of compliance appropriately respond to the Supreme Court's direction in *Michigan* to consider costs and do so in a way that is faithful to the statute. *See Michigan*, 576 U.S. at 752–53.

B. The Record Evidence Justifies EPA's Determination that, Considering the Totality of the Circumstances, Regulating Power Plants Under Section 112 Is Appropriate.

Whether one considers the record before the agency when it issued the 2016 supplemental finding on remand from the *Michigan* decision (i.e., evidence of costs and benefits from the MATS RIA) or looks at an updated record that includes subsequently developed evidence of benefits and costs, EPA's proposed decision that it is appropriate to regulate power plant HAP emissions under a totality of the circumstances approach is amply supported. The States and Local Governments believe that the most reasonable and legally supportable course is for EPA to assess the most up-to-date information and science, rather than relying on old information, much of which is known to be inaccurate (most often because it erroneously inflates costs and minimizes benefits). No court has directly addressed whether the agency, in this type of reaffirmation action under this statute, should look to the original record, or whether the agency may (or must) look to the most recent information. The States and Local Governments thus support as prudent EPA's proposal to analyze both records under its totality of the circumstances framework, with more recent information confirming the appropriateness of regulation on the initial record. In addition, the States and Local Governments note that EPA continues to rely on a series of conservative and limiting assumptions when evaluating new data, and that the benefits are even higher and the costs even lower than EPA finds based on an updated record, thus providing even more support for EPA's proposed conclusion that regulating power plant HAP emissions is appropriate and necessary.

1. The Record before the Agency in 2016 Demonstrates Abundant Public Health Benefits Sufficient to Justify Regulation in Light of the Costs.

The States and Local Governments support EPA's proposed conclusion that, looking to the initial record that was available to the agency in 2012 and that comprised the basis for the 2016 Supplemental Finding, regulation is appropriate because "the substantial benefits of reducing HAP from EGUs, which accrue in particular to the most vulnerable members of society, are worth the costs." 87 Fed. Reg. at 7668.

As EPA once again recognizes in its current Proposal, EPA's earlier rulemaking record established the extensive benefits of regulating power plant HAP emissions, both on a societal level and for the most vulnerable and exposed populations. *See* 87 Fed. Reg. at 7665. Mercury, for example, has long been known to cause neurologic, cardiovascular, immunologic, and genotoxic harms to humans, especially in fetuses and children; to have disparate impacts on certain vulnerable populations in certain watersheds, including communities experiencing poverty and communities of color; and to have adverse effects on wildlife and ecosystems. *See* 87 Fed. Reg. at 7666; MATS RIA at 4-5 to 4-10. In the initial record, EPA quantified a small subset of these benefits, consisting only of annual prenatal-methylmercury-related IQ loss in the children of recreational fishers attributable to power plant emissions, with EPA estimating that MATS-Rule emissions reductions would prevent the loss of 511 IQ points and yield lifetime earning benefits of $4 to $6 million. MATS RIA at ES-1, ES-6 tbl.ES-4; 4-56, 4-67. EPA has recognized that this estimate was extremely conservative even as to the specific subset of benefits measured,[63] and also that the MATS Rule would lead to a vast array of unquantified benefits, including, *inter alia*, reduced harm from cardiovascular and non-IQ neurological effects of mercury; reduced health risks of exposure to non-mercury hazardous air pollutants that cause cancers and neurological, cardiovascular, immunological, reproductive, liver, kidney, and respiratory effects; and reduced ecosystem harms to wildlife and ecosystem acidification. 76 Fed. Reg. at 25,003; MATS RIA at 4-68 to 4-73, 5-6 to 5-7 & tbl.5-3; 5-59 to 5-92; 77 Fed. Reg. at 9428, 9323, 9363, 9426–28; 87 Fed. Reg. at 7666.

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[63] EPA acknowledged that both its mercury risk assessment and IQ-loss quantification analyses underestimated the risks of exposures to power plant mercury emissions, in particular because IQ is "not the most sensitive neurodevelopmental endpoint affected by [methylmercury] exposure" and reliance on it "underestimates the impact of reducing methylmercury in water bodies." 77 Fed. Reg. at 9353; MATS RIA at 4-64 to 4-65. It also recognized that its focus on neurological impacts from self-caught fish did not capture exposures from consumption of commercial fish and seafood. MATS RIA at 4-65; *see also* 80 Fed. Reg. at 75,040 (noting the limited nature of the MATS rulemaking IQ-loss benefit analysis, and that EPA did not consider ocean or estuarine waterbodies or commercially caught fish as part of its analysis).

The earlier record also highlighted the disproportionate impact of HAPs on sensitive and highly exposed populations, including children, Tribal communities, and historically marginalized and overburdened communities who rely on subsistence fishing or live near power plants.[64] 77 Fed. Reg. at 9444–45; MATS RIA at 7-35 to 7-36; 76 Fed. Reg. at 25,018–19; *see also* 81 Fed. Reg. at 24,429, 24,442. And that record predicted massive co-benefits through reductions in particulate matter and sulfur dioxide emissions that reduce health risks most likely to affect sensitive populations[65] and yield important environmental benefits.[66] The MATS RIA predicted, for example, up to 11,000 avoided premature deaths, as well as a slew of other non-mortality health benefits of the MATS Rule. 77 Fed. Reg. at 9306; MATS RIA at 5-95. And although EPA was unable to quantify all categories of co-benefits (particularly those associated with ecosystem and visibility effects), its 2016 estimates of the monetized co-benefits ranged from \$59 billion to \$140 billion. 76 Fed. Reg. at 25,085; MATS RIA at 5-103.

On the cost side of the ledger, EPA in 2011 projected compliance costs of \$9.6 billion to the power sector as a whole during the first year of compliance. MATS RIA at 3-31 tbl.3-16. As it determined in 2016 and proposes to reaffirm now, that costs figure, which is certainly an overestimate, is an appropriate sum to impose on industry to achieve the manifold benefits of the MATS Rule. EPA reasonably continues to assess that such costs would not impede the electric sector's ability to "provide adequate, reliable, and affordable electricity to the American public." 87 Fed. Reg. at 7649. And EPA continues to appropriately place the compliance costs in context by comparing them against annual power sector sales and capital expenditures and by assessing their impact on electricity prices and reliability. *Id.* at 7649, 7656–58. That contextual analysis demonstrates that MATS-related compliance costs would have minimal impact on the power sector—they would represent a small percentage of sales and capital expenditures on a sector-wide basis, result in retail price increases within the range of historic variability, and have little effect on generating capacity. *Id.*

[64] *See* Env't Prot. Agency, *Revised Technical Support Document: National-Scale Assessment of Mercury Risk to Populations with High Consumption of Self-caught Freshwater Fish* ("2011 TSD") at 81, tbl.2-6, 83 Doc. ID. No. EPA-HQ-OAR-2009-0234-3057 (noting that power plant attributable mercury risk estimates for the Southeastern low income White and low income Black scenarios and for the Laotian scenario are higher than those for the typical female subsistence fish consumer).

[65] MATS RIA at ES-12 to ES-13 (co-benefit reductions will have advantageous environmental effects including reductions in visibility impairment, reduced vegetation and ecosystem effects from exposure to ozone, reduced effects from acid deposition (e.g., improved ecosystem functions), and reduced effects from nutrient enrichment (e.g., coastal eutrophication)).

[66] *Id.* at 5-95 (providing estimates of significant improvements in children's health, including reductions in acute bronchitis and asthma, from MATS Rule); *id.* at 7-36 to 7-37 (exposure to fine particulate matter can cause or contribute to adverse health effects, such as asthma and heart disease, that significantly affect many Tribal communities, communities of color, and communities experiencing poverty); *id.* at 7-38 (largest reductions in $PM_{2.5}$ mortality risk will occur in counties facing the highest risk, with poorer counties experiencing a proportionally larger reduction as compared to other counties).

In short, EPA correctly concluded that, considering the totality of the circumstances and based upon the record before it in 2016, the benefits of regulating power plant HAP emissions through the MATS Rule far outweigh the costs of doing so.

2. As EPA Properly Recognizes, an Array of New Scientific and Cost Data Developed Since 2011 Further Confirms the Immense Advantages of Regulating Power Plants Under Section 112.

The States and Local Governments laud EPA's efforts to update the record to reflect the best available information. Given the availability of new evidence, it is reasonable for EPA to account for new information on costs and benefits in reaffirming its appropriate and necessary determination; indeed, as a general matter, case law and best agency practices strongly favor reliance on up-to-date information, rather than on stale data that an agency knows to be incomplete or inaccurate. *See, e.g.*, *Med. Waste Inst. v. EPA*, 645 F.3d 420, 426 (D.C. Cir. 2011) (when an agency revises a rule on judicial remand, it should update data and procedures as appropriate); *Nat'l Ass'n of Regulatory Util. Comm'rs v. U.S. Dep't of Energy*, 680 F.3d 819, 824 (D.C. Cir. 2012) (agency should not "put [its] head in the sand" to ignore relevant and updated information). And nothing in this particular statutory scheme prohibits EPA from finding that newly developed evidence buttresses and confirms its determination that it remains appropriate and necessary to regulate power plants under Section 112. As EPA thus correctly proposes to find, such new information demonstrates that HAP impacts to human health and the environment, and the concomitant benefits of reducing power plant emissions, are substantially greater than it determined in 2011, and that costs are even lower than it had previously estimated, thus further justifying power plant HAP regulation.[67]

In particular, the States and Local Governments support EPA's use of current scientific evidence to expand its assessments of the risks posed by power plant mercury emissions to include exposures related to commercial seafood consumption and cardiovascular harms—effects that many of the States and Local Governments urged EPA to quantify when seeking reconsideration of the 2020 Action.[68] *See* 87 Fed. Reg. at 7641–44. EPA has assessed increased risk of one kind of cardiovascular death, fatal heart attacks, finding that, in as many as 10 percent of the 3,141 watersheds studied, subsistence fishers face an increased risk of heart attack mortality due to power plant mercury emissions alone. 87 Fed. Reg. at 7642; 2021 TSD at 21–22, tbl. 3. And such impacts are not borne equally: for example, "low-income Black subsistence fisher females in the Southeast" and Tribal fishers in the Great Lakes region face an increased

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[67] In addition to the new scientific studies and cost data EPA explicitly addresses, the States and Local Governments note that a large number of other studies and data published since the MATS Rule was promulgated further demonstrate that the Rule's health, environmental, and economic benefits are substantially greater than initially anticipated, and that its costs are lower than originally estimated. To that end, we have appended a letter submitted to EPA during the summer of 2021 compiling many relevant studies and data. *See* ***Exhibit B*** Letter from Megan Herzog to Erika Sasser & Nick Hutson, Re: Supplemental Comments on "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," RIN: 2060-AV12, Doc. ID No. EPA–HQ–OAR–2018–0794 (July 26, 2021).

[68] *See* 2019 States' Comments at 44, 46.

risk of fatal heart attack in up to twenty-five percent of studied watersheds in those regions. 87 Fed. Reg. at 7647 & n.70 (noting that fatal heart attack screening-analysis may have underestimated Tribal-associated risks). EPA also estimates that, without MATS-Rule mercury reductions, power plant emissions would cause five to ninety-one excess deaths each year in the general population through consumption of commercially sourced fish. 87 Fed. Reg. at 7643–44; 2021 TSD at 10–11, & tbl.1. Beyond this new analysis of cardiovascular risks, the States and Local Governments also support EPA's expansion of its 2011 IQ analysis to include prenatally exposed children in the general U.S. population, in which EPA estimates that, absent the MATS Rule, children would lose 1,600 to 6,000 IQ points due to consumption of commercially sourced fish contaminated by power-plant-contributed methylmercury. 87 Fed. Reg. at 7644, 2021 TSD at 15–16, & tbl.2.

In being able to monetize these new categories of benefits for the first time, EPA determines that the annual value of avoided fatal heart attacks could range from $40 to $720 million, and avoided IQ loss from $14 to $53 million. 2021 TSD at 25–26, & tbls. 4 & 5. EPA's present ability to assign such significant values to these previously unquantified benefits not only confirms the massive benefits of regulating power plant HAPs, but also demonstrates the appropriateness of regulation in the face of uncertainty about the exact degree of benefits—uncertainty that existed when EPA created the MATS RIA and that persists today in regard to a huge segment of still-unquantified, but certainly enormous, benefits of the MATS Rule.

EPA has also correctly considered updated information on the compliance costs of the MATS Rule. As EPA recognizes, since 2015, real-world studies confirm that its original $9.6 billion cost estimate greatly overestimated—by billions of dollars—the actual compliance costs. 87 Fed. Reg at 7651. The reasons for this are multifold, including that power plants have installed fewer controls at lower operating costs than predicted in the MATS RIA and that the price of natural gas has been lower than projected. *Id.* Many of the States and Local Governments have pointed to information demonstrating lower-than-anticipated costs in comments on prior MATS-related actions[69] and agree with EPA that it is reasonable (if not required) to consider such updated data in reaffirming the appropriate and necessary finding. *See Michigan*, 576 U.S. at 759 ("It will be up to the Agency to decide (as always, within the limits of reasonable interpretation) how to account for costs."). Like the updated benefit information, the updated costs information further confirms that regulation is appropriate when considering the advantages and disadvantages of regulation.

3. EPA's Updated Estimates Remain Conservative and Do Not Capture the Full Benefits of the MATS Rule.

Although EPA has done significant, important work to assess and monetize previously unquantified human health benefits of the MATS Rule's mercury reductions, EPA's estimates of the benefits of reducing power plant HAP emissions continue to provide an extremely conservative measure of the public health and environmental advantages of those reductions.

Research since 2011 has confirmed that the MATS RIA underestimated power plants' contribution to local mercury deposition, and thus the role of power plants in creating health and environmental risks has also necessarily been underestimated in both the MATS RIA and the

[69] *See id.* at 42–43; Comments of the Attorneys General of Massachusetts et al. ("2016 States' Comments"), Docket No. EPA-HQ-OAR-2009-0234-20551, at 8 (Jan. 15, 2016).

Proposal's expanded assessment.[70] Further, both the MATS RIA and the Proposal focus on quantifying IQ impacts from prenatal mercury exposure, however, studies have shown, and EPA acknowledges, that such exposure also causes serious, neurobehavioral harms, such as memory and learning difficulties.[71] *See supra* Section II.B.1; 77 Fed. Reg. at 9353 (explaining that because IQ is "not the most sensitive neurodevelopmental endpoint affected by [methylmercury] exposure" reliance on it "underestimates the impact of reducing methylmercury in water bodies"); MATS RIA at 4-65. Research has also shown that when the confounding neurological benefits of the omega-3 fatty acids found in seafood are considered, the dose-response relationship between IQ and methylmercury exposure is steeper than EPA assumes—i.e., more significant adverse effects occur at the same dosage level.[72] Additionally, the Proposal's quantification of cardiovascular benefits focuses only on the risk of fatal heart attacks without considering risks from other cardiovascular fatalities, as well as from non-fatal heart attacks and other cardiovascular disease, which studies have shown are substantial.[73]

Further, the mercury-health-harms assessments in the MATS RIA and the Proposal are limited to adverse effects caused by methylmercury originating from power plants alone and thus do not address the cumulative nature of methylmercury exposure to individuals who face numerous sources of exposure. Because environmental mercury contamination is so widespread, *see supra* Section I.A.2, highly exposed individuals, like those consuming larger proportions of self-caught or commercial fish, are likely to have high blood methylmercury levels based on contamination from many sources, not just power plants. Thus, as EPA acknowledges, an additional benefit of power plant mercury emission reductions that it has not quantified is the health benefits to individuals for whom power plant emissions alone do not cause exceedances of EPA's methylmercury reference dose (RfD), but who nonetheless exceed the RfD due in part to power plant mercury emissions. *See* 2021 TSD at 18.

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[70] Sunderland et al., *Benefits of Regulating Hazardous Air Pollutants from Coal and Oil-Fired Utilities in the United States*, 50 Env't Sci. Tech. 2117, 2118–19 (2018), https://pubs.acs.org/doi/pdf/10.1021/acs.est.6b00239; Yanxu Zhang et al., *Observed decrease in atmospheric mercury explained by global decline in anthropogenic emissions*, 113(3) Proceedings of the Nat'l Acad. Sci. 526, 527-28 (2016), https://www.pnas.org/doi/10.1073/pnas.1516312113.

[71] *See e.g.,* Sara T.C. Orenstein et al., *Prenatal Organochlorine and Methylmercury Exposure and Memory and Learning in School-Age Children in Communities Near the New Bedford Harbor Superfund Site, Massachusetts*, 122(11) Env't Health Persp. 1253, 1256, 1257–58 (2014), https://ehp.niehs.nih.gov/doi/10.1289/ehp.1307804 .

[72] *See* Sunderland et al. (2021), *supra* note 11, at 22; Anna L. Choi et al., *Negative Confounding in the Evaluation of Toxicity: The Case of Methylmercury in Fish and Seafood*, 38(10) Crit. Rev. in Toxicology 877-93 (2008), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2597522/pdf/nihms61457.pdf.

[73] *See* Sunderland et al. (2022), *supra* note 43, at 10–12 (considering a broader range of cardiovascular mortalities in addition to fatal heart attacks); Giang et al., *supra* note 43, at 288 (monetizing life-time benefits and economy-wide benefits from avoided non-fatal heart attacks, as well as fatal heart attacks and IQ deficits, due to MATS mercury controls); *see also* Xue Fang Hu et al., *Mercury Exposure, Cardiovascular Disease, and Mortality: A Systematic Review and Dose-Response Meta-Analysis,* 193 Env't Rsch. 110538: 4–8 (2021), https://doi.org/10.1016/j.envres.2020.110538.

Declining to consider power plant contributions to cumulative mercury exposure also discounts the greater benefits that the MATS Rule is providing to disproportionately affected, highly exposed populations that include Tribal and immigrant communities, communities experiencing poverty, and communities of color. *See supra* Section I.A.1. For example, in northern Minnesota, Tribal communities, who depend heavily on self-caught fish as a healthy source of protein and for cultural and spiritual well-being, face mercury exposure not just from upwind coal-fired power plant emissions but also from the taconite iron ore processing industry,[74] which contributes approximately half of Minnesota's in-state mercury inventory. [75] Significantly, waterbodies within such Tribal areas are highly contaminated by methylmercury[76] and ten percent of infants born in Minnesota's Lake Superior Basin—an area containing environmental justice communities—have blood mercury levels exceeding EPA's RfD.[77]

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[74] Comments of the Leech Lake Band of Ojibwe ("Leech Lake Band Comments"), Doc. ID No. EPA-HQ-OAR-2017-0664-0155, at 3–4 (Nov. 12, 2019); Comments of the Fond du Lac Band of Lake Superior Chippewa ("Fond du Lac Band Comments"), Doc. ID No. EPA-HQ-OAR-2017-0664-0156, at 4 (Nov. 12, 2019); Comments of the 1854 Treaty Authority ("1854 Treaty Authority Comments"), Doc. ID. No. EPA-HQ-OAR-2017-0664-0147, at 3–4 (Nov. 12, 2019).

[75] Minn. Pollution Control Agency, Statewide Mercury TMDL Emissions Inventory 8 (2021), https://www.pca.state.mn.us/sites/default/files/wq-iw4-02i8.pdf. The taconite iron ore processing industry is not currently regulated for mercury under section 112. 85 Fed. Reg. 45,476, 45,485 (July 28, 2020) (declining to regulate mercury emissions as part of section 112(d)(6) review because no mercury emission standard was imposed in 2003 taconite iron ore processing NESHAP).

[75] Minnesota Pollution Control Agency, *Statewide Mercury TMDL Emissions Inventory* 8 (2021), https://www.pca.state.mn.us/sites/default/files/wq-iw4-02i8.pdf (specifying draft 2019 mercury emissions of 676.3 pounds for "Ferrous Mining/Processing," out of 1395 pounds for all state sources). The taconite iron ore processing industry is not currently regulated for mercury under section 112. 85 Fed. Reg.45476, 45,485 (Sep. 15, 2019) (declining to regulate mercury emissions as part of section 112(d)(6) review because no mercury emission standard was imposed in 2003 taconite iron ore processing NESHAP).

[76] *See* Leech Lake Band Comments, *supra* note 74, at 5; Fond du Lac Band Comments, *supra* note 74, at 5, 9–10 (describing how ditched areas and wetlands increase rate of methylization in a reservation watershed). Due to that mercury contamination, several Northern Minnesota Tribes have issued fish consumption advisories for waters within their lands, including the Leech Lake Band of Ojibwe which conducts regular mercury sampling of fish, water, and other media within its lands. Leech Lake Band Comments, *supra* note 74, at 5.

[77] Minn. Pollution Control Agency, *Environmental Justice: Overview of Areas of Concern*, https://mpca.maps.arcgis.com/apps/MapSeries/index.html?appid=f5bf57c8dac24404b7f8ef1717f57d00 (map of environmental justice areas in Minnesota); Minn. Dep't of Health, *Mercury in Newborns in the Lake Superior Basin*, https://www.health.state.mn.us/communities/environment/fish/techinfo/newbornhglsp.html, (noting that ten percent of tested infants born to mothers residing in Minnesota's Lake Superior Basin exceeded the RfD); *see also* Patricia McCann, Minn. Dep't of Health, *Mercury Levels in Blood from Newborns in the Lake Superior Basin* 10, 16 tbl.2 (2011), https://www.health.state.mn.us/communities/environment/fish/docs/glnpo.pdf.

Similarly, Hmong women in the Minneapolis-Saint Paul area are exposed to mercury both through consumption of contaminated fish and the use of mercury-containing skin-lightening products.[78] Reducing the incremental contribution of power plant mercury emissions to the cumulative mercury loads of such communities thus provides a real and important health benefit that EPA has yet to quantify.

Additionally, EPA's focus on quantifying the direct human-health benefits of mercury emission reductions is also a conservative measure of the advantages of regulation because it does not incorporate the wide range of human welfare[79] and ecological benefits such regulation provides. Of significant concern to the States and Local Governments are the benefits of reduced mercury contamination to recreational and commercial fisheries, *see* MATS RIA at 5-7 tbl.5-3, from which states derive substantial economic benefit. Studies show that mercury fish consumption advisories create enormous costs to those industries, including by reducing the number of fishing days and locations. *See* IEc Report at 3–4.[80] Such advisories also decrease consumer demand even in non-sensitive populations not targeted by the advisory. *Id.* at 3. In the twelve Northeast and Midwest states considered in the IEc Report, changes in recreator and consumer behavior in response to reduced mercury contamination "are likely to result in substantial benefits to the economies and residents of these states and the Nation as a whole." *Id.* at 4. Such benefits include economic welfare benefits as well as regional and national economic activity in the form of jobs and expenditures. *Id.* at 17–18. And they can be huge; for example, a ten percent per year reduction in recreational anglers' equipment- and trip-related expenditures across the twelve states could cause a negative economic impact on the order of $1.5 billion annually. *Id.* at 23. Moreover, the value of reduced mercury levels in fish and shellfish also can be monetized through well-known quantification methods that are used by federal and state agencies bringing natural resource damages claims when acting as trustees for natural resources. *Id.* at 24.

The same natural resource damages quantification methods are, of course, also available to assess the numerous ecological benefits of reduced mercury emissions, including reduced mortality and other harms to wildlife and avoided degradation of habitats and loss of ecological services.[81] *See also, e.g.*, 87 Fed. Reg. at 7640; 81 Fed. Reg. at 24,423; 65 Fed. Reg. at 79,830.

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[78] Minn. Family Env't Exposure Tracking, MN FEET Study Report 3–5 (2019), https://www.health.state.mn.us/communities/environment/biomonitoring/docs/mnfeetcommreporten.pdf.

[79] The substantial improvements in public health associated with decreased pollution reduce costs from lost school and work days, emergency room visits, and other health care-related costs. *N. Carolina ex rel. Cooper v. Tennessee Valley Auth.,* 593 F. Supp. 2d 812, 823 (W.D.N.C. 2009)*, rev'd on other grounds,* 615 F.3d 291 (4th Cir. 2010); MATS RIA at 5-37 to 5-38, tbl.5-7; *see generally* Philip J. Landrigan et al., *The* Lancet *Commission on Pollution and Health*, 391 Lancet 462, 482–87 (2018), https://doi.org/10.1016/S0140-6736(17)32345-0 (discussing the substantial welfare costs of pollution).

[80] For instance, research found that the decline in economic value for recreational fishing trips due to the presence of a fish consumption advisory at one New York fishing location was $34.34 per fishing day at that site alone. IEc Report at 15, exh.4. Other research found that New York State property values within one mile of a lake subject to a mercury-related fish consumption advisory decrease by an average of six to seven percent. *Id.* at 23–24.

[81] *See* NESCAUM, *supra* note 31, at 15–16.

There is reason to believe such quantification approaches would show substantial monetizable benefits from power plant mercury reductions. In Virginia, for example, federal and state trustees obtained a settlement valued at $50 million for natural resource damages caused by mercury releases from an industrial facility that contaminated one hundred miles of river and floodplain.[82] The Massachusetts and federal trustees have similarly obtained nearly $10 million dollars as compensation for natural resource damages caused to aquatic habitats and wildlife by two different industrial mercury releases to rivers.[83] Given that nearly half the Nation's waterways are contaminated enough to be subject to mercury fish consumption advisories,[84] even if power plant emissions contribute only a fraction of that mercury contamination, the cumulative amount of monetizable natural resource damages is likely immense.

In sum, EPA's updated estimates of the monetized human health benefits from reduced mercury emissions under the MATS Rule represent a significant, but very conservative, estimate of the full public health and environmental advantages of reducing power plant HAP emissions.

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[82] Consent Decree, *United States v. E.I. du Pont*, No. 5:16-00082, 8, 10–12 (W.D. Va. Dec. 15, 2016),https://www.justice.gov/sites/default/files/enrd/pages/attachments/2016/12/15/env_enforcement-2631152-v1-lodged_consent_decree.pdf (obligating DuPont to pay $42 million for natural resource restoration projects and, separately, to fund renovation of a fish hatchery); Laura Vozzella, *DuPont agrees to $50 million deal to clean up mercury pollution from Va. plant,* Washington Post (Dec. 15, 2016), https://www.washingtonpost.com/local/virginia-politics/dupont-agrees-to-50-million-deal-to-clean-up-mercury-pollution-from-va-plant/2016/12/15/6bfd7a8c-c2e9-11e6-8422-eac61c0ef74d_story.html (fish hatchery renovation estimated to cost up to $10 million).

[83] These releases occurred from a former munitions manufacturing, testing, and disposal site (the Fireworks Superfund Site) in Hanover, MA, to the Drinkwater, Indian Head, and North Rivers ($6.8 million) and from the Nyanza Chemical Waste Dump Superfund Site in Ashland, MA, to the Sudbury River ($3 million). *See* Env't Prot. Agency, *Case Summary: Settlement Agreement in Anadarko Fraud Case Results in Billions for Environmental Cleanups Across the Country*, https://www.epa.gov/enforcement/case-summary-settlement-agreement-anadarko-fraud-case-results-billions-environmental#distribution ($4.475 billion payment (plus interest) to Anadarko Litigation Trust for environmental beneficiaries); Notice of Lodging of Proposed Consent Decree and Proposed Environmental Settlement, *In re Tronox, Inc.*, No. 09-10156, exh.1 (Consent Decree and Environmental Settlement), at 160, 176 (Bankr. S.D.N.Y. Nov. 23, 2010), https://www.epa.gov/sites/default/files/2013-08/documents/tronox-sa.pdf (Fireworks Superfund Site to receive $94,797 plus 0.15% of Anadarko Litigation Trust for natural resource damages); Consent Decree, *United States v. PQ Corp.*, No. 98:10760, 16 (D. Mass. Jun. 22, 1998), https://www.mass.gov/doc/nyanza-nrd-settlement-consent-decree/download; *see also* Mass. Dep't Env't Prot., *Public Information Material for Upcoming NRD Funding Opportunity at Former National Fireworks Site*, https://www.mass.gov/doc/public-information-material-for-upcoming-nrd-funding-opportunity-at-former-national-fireworks/download; Stratus Consulting, Inc., *Restoration Plan and Environmental Assessment for the Nyanza Chemical Waste Dump Superfund Site* at 3–6 (Aug. 6, 2012), https://www.mass.gov/doc/nyanza-nrd-final-restoration-plan/download.

[84] Gagnon et al., *supra* note 29, at 3.

IV. EPA's Alternative Benefit-Cost Analysis Approach is Also Permissible and Supports the Proposed Reaffirmed Finding.

EPA's totality of the circumstances approach best effectuates Congress' intent in section 112(n)(1)(A). Nonetheless, EPA's alternative benefit-cost-analysis approach is also reasonable and permissible under the statute so long as EPA considers—as it does here—*all* of the factors that Congress deemed essential to the 112(n)(1)(A) determination, even if those factors are difficult to quantify and monetize. *See City of Arlington v. FCC*, 569 U.S. 290, 296 (2013) (agency interpretation must be a "permissible construction of the statute"); *cf. Southern Electric Power Co. v. EPA*, 920 F.3d 999, 1026 (5th Cir. 2019) (rejecting EPA's "benefit-weighing approach" when it failed to account for factors that Congress expressly made relevant and was "incompatible . . . with the broader statutory scheme").

Unlike the benefit-cost analysis that EPA employed in 2020, *see* 87 Fed. Reg. at 7660, EPA's current approach to employing an economic efficiency analysis as part of its section 112(n)(1)(A) determination complies with OMB guidance and comports with the statute by accounting for all of the essential factors. First, the agency accounts for certain preexisting data gaps by developing conservative estimates for certain benefits that have been more challenging to monetize. *See Southwestern Elec. Power Co*, 920 F.3d at 1031 (declining to accept "lack of data" as a "valid excuse" for failing to regulate). In so doing, EPA recognizes that evidence developed since 2016 further demonstrates the significance of the benefits associated with regulation of hazardous air pollution from power plants. *See* 87 Fed. Reg. at 7671. Second, EPA's proposed alternative benefit-cost analysis approach comports with longstanding OMB guidance and the statute's aims by considering the full scope of monetizable benefits, including co-benefits. *See id.* at 7670. Finally, EPA's proposed alternative benefit-cost analysis approach is faithful to the statute because it accounts for factors that are difficult or impossible to quantify but are essential to the statutorily mandated determination, including the distributive impacts of hazardous air pollution and the risks to highly exposed and vulnerable individuals. *See id.* at 7669–70.

Despite the permissibility of this approach, however, the States and Local Governments, like EPA, continue to prefer the totality of the circumstances approach, which provides a more suitable methodology for giving sufficient weight to all of the factors Congress has identified explicitly and implicitly in section 112. For example, we share EPA's concern that the benefit-cost approach, even while qualitatively considering distributional risks and the importance of protecting vulnerable populations, is not the best tool to "grapple with the equitable question of whether a subset of Americans should continue to bear disproportionate health risks in order to avoid the increased cost of controlling HAP from EGUs." *Id.* at 7669.

V. The States and Local Governments Support Strengthening MATS Following a Revised Residual Risk and Technology Review.

To assist in its review of the 2020 Residual Risk and Technology Review (RTR), EPA also seeks input on several issues, including how to factor in the reductions in mercury and other hazardous air pollutants produced by the Rule, as well as information regarding the risks posed by current power plant emissions and post-2012 advances, including performance and cost changes, in the practices, processes, and control technologies used to control those emissions. 87 Fed. Reg. at 7672. The States and Local Governments support EPA's review. We urge EPA to initiate a separate rulemaking to reconsider the 2020 RTR and strengthen MATS because we are continuing to experience residual risks from power plant HAP emissions despite implementation of those standards and because the industry's actual experience in complying with the standards shows that lower emissions can be achieved at reasonable cost with available technology.

As EPA notes, power plant emissions continue to be the largest domestic source of mercury, 87 Fed. Reg. at 7672, and because many of the largest emitters are concentrated geographically, the risks posed by those residual emissions are significant. For example, the Midwest states of North Dakota and Missouri, upwind of certain members of our coalition, rank second and third in the Nation for power plant mercury emissions, emitting 829 and 345 pounds of mercury, respectively, in 2020.[85] Emissions from those plants and others in the region adversely affect downwind states by contributing to the cumulative mercury exposures faced by residents and natural resources in those states. Illinois, for instance, is downwind of numerous coal-fired plants in the region and borders Missouri, where several coal-fired units are situated just across the state-line.[86] Such continued out-of-state mercury emissions are of particular concern for communities overburdened by mercury exposure, such as Tribal communities in Minnesota, who are high consumers of self-caught-fish, and other Minnesota communities with environmental justice concerns, who are exposed to mercury emissions not only from neighboring North Dakota, but also from the in-state taconite iron ore processing industry. *See supra* Section III.B.3.

We strongly encourage EPA during its 2020 RTR review to include a robust evaluation of these kinds of cumulative exposure harms that current power plant HAP emissions exacerbate. That analysis is necessary to fully account for the risks those emissions pose to communities already facing disproportionate exposure to such pollutants. Further, in addition to such cumulative exposure harms, the myriad ways in which EPA's past and current assessments have underestimated the mercury risks posed by power plant emissions are relevant to its residual risk assessment under section 112(f)(2). *See supra* Section III.B.3.

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[85] *See* Env't Prot. Agency, *Progress Report: Emissions Reductions: MATS State-by-State* (2020), https://www3.epa.gov/airmarkets/progress/reports/emissions_reductions_mats.html#figure2 (individual state power plant mercury emissions for 2020 available by selecting 2020 version of map and clicking on individual states in map); *see also* Adam Willis, *US coal plants slashed their mercury pollution. North Dakota accounts for a big share of what remains*, InForum, Mar. 4, 2022, https://www.inforum.com/news/north-dakota/us-coal-plants-slashed-their-mercury-pollution-north-dakota-accounts-for-a-big-share-of-what-remains?utm_source=ourcommunity now&utm_medium=web.

[86] *See* Env't Prot. Agency, *supra* note 85; William Skipworth, *Labadie plant to stay open as Ameren moves to close Rush Island plant sooner than originally planned*, eMissourian.com (Dec. 26, 2021), https://www.emissourian.com/local_news/labadie-plant-to-stay-open-as-ameren-moves-to-close-rush-island-plant-sooner-than/article_66f7d5fe-6669-11ec-8bc0-3f4e19d96fd1.html?utm_medium=social&utm_source=email&utm_campaign=user-share (Labadie Energy Center, situated on the Missouri River, will continue operating until 2042); *see also* Kavahn Monsouri, *Midwest Coal-Fired Power Plants are Among the Country's Worst Polluters, but They Don't Break EPA Rules*, Nebraska Public Media, (Jan. 11, 2022), https://nebraskapublicmedia.org/de/news/news-articles/midwest-coal-fired-power-plants-are-among-the-countrys-worst-polluters-but-they-dont-break-epa-rules/.

With regard to EPA's section 112(d)(6) consideration of "developments in practices, processes, and control technologies," the States and Local Governments note, as EPA recognizes, 87 Fed. Reg. at 7634, 7651, 7655, that annual compliance costs for the industry have been significantly lower than EPA estimated in 2011, due in part to improvements and cost reductions in pollution controls, including the activated carbon technology used to control mercury.[87] Moreover, many of the undersigned States have for years been controlling mercury emissions under state law at reasonable cost and often under stricter standards than the MATS Rule.[88] *See supra* Section I.A.2. Thus, it is not surprising that nearly all power plant units reported 2020 emissions below the Rule's mercury standards—and many significantly below those standards.[89] These facts strongly indicate that it is "necessary" for EPA to strengthen those standards as part of its review. *See* 42 U.S.C. § 7412(d)(6).

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[87] *See* NESCAUM *supra* note 31, at 11.

[88] *See id.* at 10; Comments of the National Association of Clean Air Agencies on EPA's Proposed Supplemental Finding, Doc. ID No. EPA-HQ-OAR-2009-0234-17620, at 7 (Aug. 4, 2011) ("To our knowledge, no source has failed to comply with state deadlines for achieving [mercury] limitations, and no significant adverse impacts on electric system reliability were encountered as units were upgraded to meet state requirements."); *id.* at 6 ("Years, and in some cases decades, of experience demonstrates that [the technologies available to reduce power plant hazardous air pollutant emissions] can reliably deliver the expected performance at reasonable cost.").

[89] *See* Nat. Res. Def. Council, *MATS Data Analysis* 7–10 (Aug. 2021), https://www.nrdc.org/sites/default/files/mats-data-analysis-202108.pdf.

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Exhibit A

IEc

The Economic Benefits of the Mercury and Air Toxics Standards (MATS) Rule to the Commercial and Recreational Fishery Sectors of Northeast and Midwest States

Final Report | 17 April 2019

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This report was prepared in response to:

EPA's Proposed Revised Supplemental Finding for the Mercury and Air Toxics Standards, and Results of the Residual Risk and Technology Review

Re: National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review.

Docket ID No. EPA-HQ-OAR-2018-0794. Federal Register Vol. 84, No. 26, Thursday, February 7, 2019. Proposed Rules.

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THE ECONOMIC BENEFITS OF THE MERCURY AND AIR TOXICS STANDARDS (MATS) RULE TO THE COMMERCIAL AND RECREATIONAL FISHERY SECTORS OF NORTHEAST AND MIDWEST STATES

INTRODUCTION AND PURPOSE OF THIS REPORT

On December 27, 2018, the U.S. Environmental Protection Agency (EPA) proposed to revise the Supplemental Cost Finding for the Mercury and Air Toxics Standards (the "MATS Rule"), as well as to complete the Clean Air Act (CAA) required risk and technology review associated with the MATS Rule (EPA 2018). On February 7, 2019 EPA published and asked for public comment on a Proposed Rule (EPA 2019). Specifically, EPA proposes to compare the cost of compliance with the MATS Rule solely with what EPA maintains are the direct, monetized benefits specifically associated with reducing emissions of the hazardous air pollutant (HAP) mercury in order to satisfy the duty to consider cost in the context of the CAA section 112(n)(1)(A) "appropriate and necessary" finding (U.S. EPA 2019, pp. 2674). While EPA states that there are unquantified HAP benefits and significant monetized particulate matter (PM) co-benefits associated with the MATS Rule, it notes the Administrator has concluded that the identification of these benefits is not sufficient, in light of what EPA has characterized as the "gross" imbalance of monetized costs and HAP benefits, to support a finding that it is appropriate and necessary to regulate Electric Generating Units (EGUs) under CAA section 112 (EPA 2019, pp. 2677).

Reopening the MATS Rule could result in a lifting of regulatory limits on mercury emissions from EGUs in the United States. This regulatory change could generate a significant increase in mercury emissions from the source category, leading to higher mercury levels in waterbodies that are subject to atmospheric deposition and loadings of mercury. An increase in atmospheric loadings would in turn increase mercury levels in the edible portions of recreationally and commercially harvested fish and shellfish. Given that state and federal agencies, as well as non-governmental entities, provide guidance to recreators and consumers to limit their exposure to mercury from consumption of fish and shellfish, any increases in mercury levels could result in changes in recreator and consumer behaviors. These behavioral changes would have an adverse impact on the wellbeing of recreators and negative consequences for the regional economies of the Northeast and Midwest.

The purpose of this report is to assess the potential impact of elevated mercury fish tissue contamination on the recreational and commercial fishing industries of the Northeast and Midwest,[1] as well as the scale of the potential economic benefits of the MATS Rule on those regionally-important economic sectors. Specifically, we ask the following questions:

- *To what extent do power plant emissions contribute to mercury in the environment, particularly in sportfish and commercially harvested fish tissue (as compared to other sources)?*
- *What actions have Northeast and Midwest states and federal agencies taken to limit the public's exposure to mercury from freshwater and saltwater fish consumption in order to protect public health (i.e., recreationally caught fish consumption advisories (FCAs); commercially harvested seafood health guidelines)?*[2] *What information do recreators and consumers receive from non-governmental organizations on the risks of exposure to mercury from self-caught and commercially caught fish species.*
- *How do FCAs affect anglers' propensity to fish and the associated economic benefits of recreational fishing, including consumer surplus (i.e., values incurred by anglers) and regional economic contributions (i.e., jobs, income) from fishing trip expenditures? How do health guidelines on commercially harvested seafood affect demand for commercially important species, and by extension consumer and producer surplus and jobs/economic activity across the broader regional economy?*
- *What is the scale of recreational fishing activity in the Northeast and Midwest? What is the scale of economic activity associated with commercial catch and revenues? Given the scale of these activities, what is the potential economic benefit of the MATS Rule?*
- *Could EPA estimate the change in economic wellbeing and regional economic activity that has and could result from maintaining the MATS Rule?*

Our findings, described in detail below, are as follows:

- Emissions of mercury from coal-fired EGUs are a significant contributor to total mercury levels in fish and shellfish in the Northeast and Midwest states.

[1] We consider the following states in this report: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont for the Northeast; and Illinois, Michigan, Minnesota, and Wisconsin for the Midwest. However, we note that the benefits of the MATS Rule described in this report also likely exist for other states experiencing elevated fish tissue concentrations of mercury due to emissions from EGUs.

[2] References to "seafood" in this report include fish harvested commercially from both marine and freshwater.

- The existing MATS Rule, effective since 2015, has reduced mercury loadings to aquatic systems, in turn leading to a reduction in mercury levels in fish and shellfish.
- Given the health risks posed by mercury to human health, federal and state agencies have acted to put in place consumption advisories for fish and shellfish harvested commercially, recreationally, and by subsistence fishers.
- These advisories are intended to change individuals' behavior and thus protect sensitive populations and the general public from the health risks of mercury.
- In addition, non-governmental organizations and private businesses provide consumers with information on the risks of consuming fish and shellfish that are high in mercury.
- The public has been shown to respond to these advisories and other sources of information by changing their recreational and subsistence behaviors, as well as their consumption patterns for commercially harvested fish and shellfish.
- The total contribution to economic welfare in the 12 states considered in this analysis resulting from recreational fishing activity is approximately $7.5 billion *per year*.
- Recreational fishing and commercial fish and shellfish harvest and processing are substantial contributors to the regional economies of the Northeast and Midwest. While the specific contributions vary from year to year, recreational fishing contributes $16 billion (2019 dollars) in value added annually (i.e., contribution to regional GDP) to the economies of 12 states in these regions, and approximately 259,000 jobs.[3] Additionally, annual commercial fish landings for these 12 states generate $1.6 billion in value added annually (specific estimate is variable from year to year), and approximately 18,000 jobs.
- Adverse changes in recreational behavior and purchase patterns for commercially harvested fish and shellfish reduces economic welfare (e.g., consumer surplus) and regional economic activity (e.g., jobs and expenditures) in the Northeast and Midwest states.[4] The magnitude of economic impacts increases as contamination worsens and FCAs become more restrictive.

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[3] In the context of regional economic impact analysis, which reflects a single-year snapshot of impacts on economic activity levels in a region, the metric "jobs" refers to "job-years," defined as one job lasting one year.

[4] Consumer surplus is the difference between the price of the good or service and the amount we would be willing to pay for that good or service before we would forgo consumption. In the case of recreational behavior, if the cost of a day of fishing (i.e., the cost of getting to a fishing site and the opportunity cost of not working) is less than the participant's willingness to pay for the experience, the individual experiences a gain in consumer surplus (i.e., social welfare). When the quality of a recreational experience declines, the consumer surplus also declines, reflecting a lower willingness to pay for the experience.

- Given the importance of recreational fishing and the commercial fishing and processing sectors to the economies of the Northeast and Midwest, even modest changes in recreator and consumer behavior in response to reductions in mercury concentrations from the MATS Rule are likely to result in substantial benefits to the economies and residents of these states and the Nation as a whole. While this report does not evaluate the specific effects of the MATS Rule on contaminant and FCA levels, this analysis does find that it is reasonable to conclude that the Rule may generate recreational and commercial fishing benefits in excess of $1 billion *annually*.
- There are widely accepted methods that EPA could have used to monetize the benefits of reduced mercury concentrations in recreationally caught and commercially harvested fish. These benefits would include both regional economic performance (including jobs and expenditures) as well as social welfare benefits. However, despite the availability of these methods, neither the previous EPA rulemaking nor the current proposed rulemaking attempt to measure these benefits or even describe them qualitatively.

THE ROLE OF POWER PLANT EMISSIONS IN CONTRIBUTING TO MERCURY CONCENTRATIONS IN FISH AND SHELLFISH

Mercury (Hg) is an element found throughout the environment. It exists in elemental (metallic), organic (methylmercury), and inorganic forms. Natural sources of mercury enter the environment from volcanic activity, forest fires, and weathering of rocks (UNEP 2019). Anthropogenic sources of mercury include fossil fuel combustion, artisanal and small-scale gold mining and other mining activities, industrial activity, and incineration of waste (Giang and Selin 2016, UNEP 2019, Driscoll *et al.* 2013, Pacyna *et al.* 2010). In addition to primary sources of mercury, mercury can be remobilized from environmental sources (e.g., soil, sediment, water) where previously deposited (UNEP 2019, Giang and Selin 2016).

While mercury is an element and is thus naturally occurring, atmospheric deposition of mercury has increased by a factor of two to five since preindustrial times, with even higher increases in deposition rates in industrialized areas (Fitzgerald *et al.* 1998, Krabbenhoft and Sunderland 2013, Swain *et al.* 1992, UNEP 2019). Burning of fossil fuels—mainly coal—is a significant source of anthropogenic mercury, contributing 24 to 45 percent of total global anthropogenic mercury emissions (UNEP 2019, Pacyna *et al.* 2010). In North America, fuel combustion is the highest contributor of anthropogenic mercury emissions, estimated to be around 60 percent of total anthropogenic emissions. North American anthropogenic sources, on average, contribute roughly 20 to 30 percent of total mercury atmospheric deposition within the continental United States (Selin *et al.* 2007). The remainder comes from anthropogenic sources in other countries and from natural sources.

Mercury is released in the form of gaseous elemental mercury (Hg^0) from EGUs during combustion. Once in the atmosphere, it can be transported over short and long distances (Giang and Selin 2016, Driscoll *et al.* 2013). In the atmosphere, it reacts with oxidants to form water soluble inorganic mercury species (Hg^{II}) where it can then be deposited via precipitation to terrestrial and aquatic ecosystems. Some of this mercury is then cycled through aquatic systems where it can form organic mercury (methylmercury; Vijayaraghavan *et al.* 2014, Krabbenhoft and Sunderland 2013). Methylmercury, a known toxicant for wildlife and humans, is known to biomagnify through food chains, with higher trophic level organisms acquiring increasingly large body burdens (UNEP 2019). Nearly all the mercury in humans, fish, and predatory insects is in the form of methylmercury (Harris *et al*. 2007, Mason *et al.* 2000, Cristol *et al.* 2008, Driscoll *et al*. 2007). Overall, the proportion of methylmercury in organisms is a function of food chain length (Knightes *et al*. 2009). Fish are predominantly exposed to mercury in the water column (via atmospheric deposition), but are also exposed through contaminated sediments and terrestrial transport from the watershed where mercury has been stored (Harris *et al*. 2007, Mason *et al*. 2012). Humans are subsequently exposed to methylmercury via fish consumption.

The distance that emitted mercury can travel depends on the form emitted; elemental mercury (Hg^0) can transport further than particulate or mercury gas (Hg^{II}), which are generally deposited closer to the source (Giang and Selin 2016, Driscoll *et al*. 2013). Studies have suggested that, although the timeframe over which the impacts occur is uncertain, a reduction in inorganic mercury loading would directly reduce exposure of fish and subsequent mercury concentrations in fish (Vijayaraghavan *et al*. 2014, Mason *et al*. 2012, Selin *et al*. 2010, Harris *et al.* 2007, Krabbenhoft and Sunderland 2013, Giang and Selin 2016; Knightes *et al*. 2009).

Overall, there is broad agreement in the literature that a decline in anthropogenic mercury inputs will lead to a relatively proportional decrease in fish tissue concentrations (Giang and Selin 2016, Lee *et al*. 2016, Cross *et al*. 2015, Vijayaraghavan *et al*. 2014, Evers *et al*. 2011). Giang and Selin (2016) modeled various policies and mercury reduction scenarios on a national and global scale relative to a no policy scenario. Their results show that from the baseline of year 2005, by the year 2050, with the MATS Rule in place, there would be a 20 percent reduction in mercury deposition in the Northeast and a six percent reduction in deposition to global oceans relative to a no policy scenario. The authors note that, while reductions in mercury emissions will result in national reductions in exposure to mercury from fish consumption, there are potential uncertainties in predicting the timeframe associated with these benefits due to ecosystem dynamics, as well as mercury from sources outside the U.S. Other studies have modeled emission reductions in North America and subsequent regional reductions in mercury, noting that emission reductions would particularly affect mercury concentrations in fish in the Northeast (Selin *et al*. 2010). Lee *et al*. (2016) found a 19 percent decline in Atlantic bluefin tuna mercury concentrations from 2004-2012 relative to a 20 percent decline in North Atlantic mercury emissions from 2001-2009. With fewer samples, Cross *et al*.

(2015) found a similar reduction in bluefish tissue concentration from 1972 to 2011 in response to reductions in atmospheric deposition and other mercury inputs (e.g., point source).

Depending on where fish species reside in the water column, their prey, and the physiochemical parameters of the system, the response of mercury concentrations in fish to a reduction of mercury from EGUs will range from a rapid reduction over a few years or decades to long-term reductions over centuries (Vijayaraghavan *et al*. 2014, Knightes *et al*. 2009). For example, using a lake in New Hampshire as a modeled case study for mercury reductions in fish tissue, Vijayaraghavan *et al*. (2014) found it would take more than 50 years for fish tissue to proportionally reflect the reduction in atmospheric mercury deposition as a result of local and regional emissions reductions. However, fish tissue would begin to reflect reductions in atmospheric mercury deposition within three to eight years.

In short, while the timeframe of reductions in mercury concentrations in fish tissue in response to emissions reductions ranges, the relationship is clear: Policy changes requiring a reduction in mercury emissions from EGUs will reduce mercury deposition and subsequent fish tissue mercury concentrations. These changes in fish tissue mercury concentrations and human exposure from fish consumption will vary by location, species, and watershed and waterbody, but are expected to occur widely across the Northeast and Midwest.

ACTIONS STATES HAVE TAKEN TO LIMIT PUBLIC EXPOSURE TO MERCURY IN FISH AND SHELLFISH

As described above, coal-fired EGUs are a significant source of mercury emissions in North America. As such, emissions from this source are a significant contributor to mercury concentrations in fish and shellfish caught, purchased, and consumed in the United States. Federal and state agencies are responsible for disseminating information about mercury levels in self-caught and purchased fish products and encouraging safe consumption habits for members of the public. For example, by issuing FCAs, federal and state agencies seek to limit the population's exposure to high mercury levels and avoid adverse health effects in the population, including especially sensitive populations (e.g., pregnant women, young children). In addition to governmental guidelines, popular seafood chains and retailers, public health research organizations, environmental and consumer advocacy groups, and educational organizations provide consumers with materials to encourage and facilitate safe fish consumption.

Federal and state agencies generally provide details on safe fish consumption behaviors based on waterbody, fish size and species, serving size, and serving frequency (see Exhibit 1 below). Consumption advisories are generally categorized as either targeting a sensitive population (i.e., pregnant women, women of childbearing age, young children, and adolescents) and general population, reflecting the role mercury plays in neurological development (U.S. Environmental Protection Agency 2017). Appendix A includes three examples of general statewide safe fish guidelines: Michigan and Vermont both provide a general list of fish species from their respective waterbodies, chemical(s) of concern, size of fish, and servings per month based on consumers' classification as a "sensitive population. Massachusetts lists advisories for specific waterbodies that include advice regarding which species of fish should be avoided by certain populations (or in some instances, all populations) based on the presence of certain contaminants. In addition to providing specific advisory information, the U.S. EPA, the U.S. Food and Drug Administration, and many states provide information on the risk of health effects of mercury exposure in humans, contextual information on bioaccumulation and biomagnification of mercury in fish, and undertake contamination monitoring and mitigation efforts.

EXHIBIT 1. EXAMPLES OF FEDERAL AND STATE MERCURY ADVISORIES AND GUIDANCE

JURISDICTION	HOW INFORMATION IS COMMUNICATED	EXAMPLE OF GUIDANCE	OTHER INFORMATION	SOURCE
U.S. Environmental Protection Agency	Webpages and factsheets	Recommended serving size and frequency for about 60 fish species based on their mercury levels for sensitive populations		http://www2.epa.gov/choose-fish-and-shellfish-wisely
U.S. Food and Drug Administration	Chart targeted at pregnant women and parents	Serving amount and size for "best", "good", and "to avoid" choices	Data collected from 1990 – 2012 of mercury levels in commercial fish and shellfish	https://www.fda.gov/Food/ResourcesForYou/Consumers/ucm393070.htm
State of Connecticut, Department of Public Health	Guides for fish caught in Connecticut waters and store-bought fish	Weekly/monthly serving amount for fish species for general and sensitive populations, monthly serving amount for fish species caught in Connecticut waterbodies		http://www.ct.gov/dph/cwp/view.asp?a=3140&q=387460&dphNav_GID=1828&dphNavCtr=|#47464
State of Illinois, Department of Public Health	List of specific fish species with mercury advisories	Meal amount per week or month for fish species for general and sensitive populations	Interactive map of waterbodies per county that lists all the fish advisories, including pictures of each species	http://dph.illinois.gov/topics-services/environmental-health-protection/toxicology/fish-advisories
Commonwealth of Massachusetts, Department of Public Health	List of waterbodies/towns in Massachusetts with fish consumption advice, guidelines for fish consumption for marine and fresh waterbodies	Advice is provided for fish species and recommended monthly fish consumption amounts for general and sensitive populations	Searchable directory of advisories per waterbody and town	http://www.mass.gov/dph/fishadvisories

JURISDICTION	HOW INFORMATION IS COMMUNICATED	EXAMPLE OF GUIDANCE	OTHER INFORMATION	SOURCE
State of Maine, Center for Disease Control & Prevention	Safe eating guidelines for freshwater fish in Maine waterbodies and saltwater bodies	Freshwater guide: recommended monthly serving amount Saltwater guide: serving amount for sensitive and general populations	Poster with images and a scale of fish-mercury levels in store-bought and self-caught fish; Maine Center for Disease Control and Prevention's Family Fish Guide which details fish type, size, serving amount, fish origin, and cooking methods are safe to eat for sensitive populations	http://www.maine.gov/dhhs/mecdc/environmental-health/eohp/fish/
State of Michigan, Department of Community Health	Statewide safe fish guidelines, and regional Eat Safe Fish Guides for species found in Michigan waterbodies	Serving size based on person's weight, size of fish caught, monthly serving suggestion, chemical of concern	Guide for safe serving amount of fish from a grocery store or restaurant that also includes information on omega-3 fatty acids	http://www.michigan.gov/eatsafefish
State of Minnesota, Department of Health	Safe eating guidelines for general and sensitive populations; list of Minnesota waterbodies and corresponding meal advice for general and sensitive populations	Serving amount and frequency of MN caught and purchased fish, fish size	Level of mercury in fish and corresponding meal frequency for general and sensitive populations	http://www.health.state.mn.us/divs/eh/fish/index.html
State of New Hampshire, Fish and Game Department	Fish consumption guidelines for freshwater and saltwater	Recommendations for monthly serving amount/size of fish, no specific information of species and water body guidelines easily accessible		http://www.wildlife.state.nh.us/fishing/consume-fresh.html
State of New Jersey, Departments of Environmental Protection and Health	List of all species in each waterbody with an advisory; there are separate lists for estuarine & marine waters, and inland waterbodies	Serving frequency for general and sensitive populations	Images of fish species; interactive map to locate waterbody specific advisories	http://www.state.nj.us/dep/dsr/njmainfish.htm
State of New York, Department of Health	List of advisories per waterbody in each region of the state	Fish species, serving frequency recommended for general and sensitive populations, chemicals of concern		https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/

JURISDICTION	HOW INFORMATION IS COMMUNICATED	EXAMPLE OF GUIDANCE	OTHER INFORMATION	SOURCE
State of Rhode Island, Department of Health	Brochure targeted to pregnant women and parents	List of safe species of RI-caught fish and generally low mercury level fish		http://www.health.ri.gov/healthrisks/poisoning/mercury/about/fish/
State of Vermont, Department of Health	List of general fish consumption guidelines and for specific waterbodies	Fish species and serving frequency per general and sensitive populations		http://healthvermont.gov/health-environment/recreational-water/mercury-fish
State of Wisconsin, Department of Natural Resources	List of general and specific waterbody fish consumption advisories	Fish species, fish size, serving frequency for general and sensitive populations	Search directory of county and advisory area (waterbody)	http://dnr.wi.gov/topic/fishing/consumption/

Consumers also can access information on fish and shellfish safety, health benefits/effects, and consumption from additional sources. Retail chains, research organizations/academic institutions, environmental advocacy groups, and consumer protection groups publish contextual information on mercury consumption, and safe consumption guidelines. These sources of information can sometimes be redundant of state and federal guidelines, and are designed to be supplemental to official advisories, to ensure that consumers have all pertinent information available to them prior to purchasing or consuming potentially toxic fish product. Some of these sources include:

- The grocery chain Whole Foods publishes "Mercury in Seafood: Frequently Asked Questions" which explains the health concerns of elevated levels of methylmercury in fish, and lists fish species safe for consumption, while referring to EPA and FDA guidelines;
- The Safina Center at Stony Brook University's "Mercury in Seafood: A Guide for Consumers" recommends serving size for several popular fish species and discusses risks and signs of methylmercury exposure. The Safina Center also publishes brochures for health care professionals and a full report on mercury in the environment;
- The Gelfond Fund for Mercury Research & Outreach's "Seafood Mercury Database" aggregates government data and scientific literature of mercury levels in commercial fish in the U.S.;
- Environmental Working Group publishes a "Consumer Guide to Seafood" and has an interactive "Seafood Calculator" tool that allows users to input their weight and basic health condition to get specific recommendations of species of serving size based on mercury content, omega-3 fatty acid content, and sustainability; and

- Environmental Defense Fund's "Seafood Selector" gives recommended serving size of fish species based on age, the fish species' eco-rating, contaminant level, and omega-3 level.

FCAs aim to reduce the amount of fish consumed to safe levels, and/or suggest safer alternatives for consumers (e.g., switching species consumed). Research on the role of advisories on consumer behavior suggests that they are a useful public health tool in reducing methylmercury exposure levels in sensitive human populations. An analysis of the effectiveness of advisory scenarios on minimizing blood-mercury levels in humans from fish consumption suggests that strategies that aim to reduce methylmercury exposure through reducing fish consumption overall are more effective than strategies intended to encourage safer alternative species (Carrington *et al.* 2004). One study focused on responses to an FDA advisory in 2001 found that information-based advisories can achieve the agency goal of minimizing consumption of mercury in fish if the advisories are targeted toward the sensitive populations of pregnant women, children, and women of child-bearing age (Shimshack, Ward, and Beatty 2007). Shimshack *et al.* found that education and readership were determinants of people's responses to fish health advisories, suggesting that advisories need to be more accessible and targeted towards the highest risk and lowest educated population to ensure FDA's goals of reducing exposure to mercury from fish consumption through reduced purchases and therefore consumption of fish products (2007). Furthermore, a survey study by the Epidemic Intelligence Service at the Centers for Disease Control demonstrated that awareness of sport fish health advisories in Midwest states among women, people of color, and persons with lower educational attainment is low compared to traditionally targeted licensed angles who tend to be white men (Tilden *et al*. 1997). This finding suggests that accessible and targeted communication of the risks and health effects associated with fish consumption are crucial in effectively decreasing mercury exposure through consumption (Tilden *et al.* 1997).

THE ROLE OF ADVISORIES AND HEALTH GUIDELINES IN ANGLER AND CONSUMER BEHAVIOR

While advisories are likely to reduce the public's exposure to mercury by modifying consumption patterns of fish and shellfish, these behavioral changes reduce social welfare and adversely impact regional economies. In this section we consider impacts to both recreational anglers as well as consumers purchasing fish and shellfish commercially sold in the marketplace.

RECREATIONAL FISHING

Numerous published studies have identified the negative impact that FCAs have on the quantity and quality of recreational fishing trips. The primary reason that anglers change their behavior in response to FCAs is because they are concerned about consuming species covered by the FCA or sharing it with friends and family. Since some anglers may practice catch-and-release fishing, they may not be affected. However, since many anglers fish to keep and consume their catch, FCAs do have an impact on recreational fishing behavior.

When recreational anglers change their behavior, there are two types of economic losses: 1) lost social welfare value of fishing to recreationists (i.e., the consumer surplus they experience from fishing) and 2) lost regional economic activity. The term social welfare value refers to the difference between the maximum amount a recreationist would be willing to pay to participate in a recreational activity and the actual cost of participating in that activity. This is referred to by economists as consumer surplus or net economic value.

A decline in value for recreational fishing trips can arise for the following reasons:

- Anglers may continue to fish at affected sites, but enjoy their fishing less (i.e., diminished use);
- Anglers may choose to fish at other sites (i.e., substitute use); and
- Anglers may forgo fishing entirely (i.e., lost use).

The behavioral responses above and losses in economic value have been documented for mercury-based advisories (e.g., Tang *et al*. 2018; Jakus and Shaw 2003; Jakus *et al*. 2002; Hagen *et al*. 1999; Chen and Cosslett 1998; MacDonald and Boyle 1997) as well as for other contaminants (e.g., MacNair and Desvousges 2007; Morey and Breffle 2006; Hauber and Parsons 2000; Parsons *et al*. 1999; Jakus *et al*. 1998, 1997; and Montgomery and Needelman 1997). Claims for lost economic value due to recreational mercury-based fishing advisories have been developed for several natural resource damage assessments (NRDAs) (e.g., Confederated Tribes of the Colville Reservation *et al*. 2012; Texas General Land Office *et al*. 2001; IEc 2017).

Economic value is distinct from the amount that anglers actually spend on their trips, such as gasoline to fuel their vehicles to reach a site or to make purchases of fishing gear. These expenditures support regional economic activity in the form of jobs and income.[5] When anglers take fewer trips or spend less money on their trips due to FCAs, there is a decline in regional economic activity associated with recreational fishing.

In the sections below, we summarize available literature on behavioral responses of recreational anglers to FCAs and the resulting impacts on economic value and regional economic activity. The discussion emphasizes impacts from mercury-based FCAs, but includes impacts from other contaminants (e.g., polychlorinated biphenyls or PCBs) to provide additional perspective on how FCAs affect behavior as the literature is reasonably consistent, regardless of contaminant source.

[5] The summation of trip expenditures and economic value incurred when a trip is taken is called an angler's willingness to pay.

Changes In Recreator Behavior

Several studies, which are summarized in Exhibit 2, have demonstrated that anglers change their behavior in response to FCAs. The behavioral responses to FCAs include changing fishing destination (i.e., substitute use) and taking fewer trips (i.e., lost use), as well as other responses such as targeting different species, eating fewer fish or refraining from consumption entirely (including sharing it with others), and changing cooking methods.[6] While some anglers might not report changes in their behavior, they may still enjoy their fishing less (i.e., diminished trips) or have concerns about consuming their catch. Any of these behavioral responses results in a decline in value if the angler feels worse off than if the FCA were not present. Further, anglers may take fewer trips or spend less money on their trips due to FCAs, which results in a decline in regional economic activity.

Recent data demonstrate that recreational fishing is a popular activity in the Northeast and Midwest. Exhibit 3 presents estimates of annual fishing days taken to selected states in these regions and in total. Applying the range of percentages from Exhibit 2 to the user day estimates in Exhibit 3 results in a large estimated number of affected user days, which may be expressed either in terms of changes in participation, substitution, or diminished use or through other behavioral responses (e.g., changing target species, eating fewer fish). Losses in recreational fishing value associated with these behavioral responses are described in the next section.

EXHIBIT 2. RECREATIONAL ANGLER BEHAVIORAL RESPONSES TO FCAS

STUDY	LOCATION	BEHAVIORAL RESPONSES
USFWS and Stratus Consulting (1999)	Lower Fox River/ Green Bay	-30% spend fewer days fishing -31% change locations fished -23% target different species -45% change the species they keep to eat -47% change the size of fish they keep to eat -45% change the way they clean/prepare fish -25% change the way they cook fish
Connelly *et al*. (1990)	New York	-17% take fewer trips -31% change fishing locations -46% change cleaning/cooking methods -51% eat fewer fish from the site -17% eat different species -11% no longer eat fish from the site

[6] While changes in cooking and preparation methods can be effective for fat-soluble contaminants (e.g., PCBs), they are largely ineffective for mercury contamination since mercury does not concentrate in specific body tissues.

STUDY	LOCATION	BEHAVIORAL RESPONSES
Connelly *et al*. (1992)	New York	-18% take fewer trips -45% change cleaning methods -25% change the size of fish consumed -21% change cooking methods -70% eat less fish from the site -27% eat different species -17% no longer eat fish from the site
Connelly *et al*. (1996)	Lake Ontario	-79% use risk-reducing cleaning methods -42% use risk-reducing cooking methods -32% would eat more fish in the absence of FCAs
Kunth *et al*. (1993)	Ohio River	-37% take fewer trips -26% change fishing locations -26% change targeted species -23% change cleaning methods -17% change the size of fish consumed -13% change cooking methods -42% eat less fish from the site -13% no longer eat fish from the site
Vena (1992)	Lake Ontario	-16% take fewer trips -30% change fishing locations -20% change targeted species -31% change cleaning methods -53% eat less fish from the site -16% no longer eat fish from the site
MacDonald and Boyle (1997)	Maine	-15% would consume more fish -10% would fish more days -5% would fish more waters -5% would fish different waters
Silverman (1990)	Michigan	-10% take fewer trips -31% change fishing locations -21% change targeted species -56% change cleaning methods -41% change the size of fish consumed -28% change cooking methods -56% eat less fish from the site -31% eat different species
West *et al*. (1993)	Michigan	-86% change cooking methods (Great Lakes anglers) -80% eat different species (Great Lakes anglers) -46% eat less fish from the site (overall) -27% change cooking methods (overall) -80% are aware of advisories; of these 80%, 75% change cleaning methods

EXHIBIT 3. ESTIMATES OF ANGLERS AND FISHING EFFORT NORTHEAST AND MIDWEST STATES[7]

STATE	ANGLERS	DAYS OF FISHING	AVERAGE DAYS PER ANGLER
Connecticut	342,000	4,705,000	14
Illinois	1,044,000	13,343,000	13
Maine	341,000	3,873,000	11
Massachusetts	532,000	8,367,000	16
Michigan	1,744,000	28,177,000	16
Minnesota	1,562,000	21,702,000	14
New Hampshire	228,000	4,370,000	19
New Jersey	766,000	9,454,000	12
New York	1,882,000	29,874,000	16
Rhode Island	175,000	2,080,000	12
Vermont	207,000	2,215,000	11
Wisconsin	1,247,000	21,284,000	17
Total	10,070,000	149,444,000	15
Source: USFWS and U.S. Census Bureau (2018)			

Lost Value for Recreational Fishing

Several studies estimate the decline in economic value for recreational fishing trips due to the presence of FCAs. Exhibit 4 summarizes the estimated decline in value per trip to a site with an FCA for selected studies. These studies use a well-accepted method—random utility site choice models—and the results can be standardized for comparison (see footnote to Exhibit 4). In site choice models, anglers are assumed to choose sites that maximize their utility (i.e., the value gained). The utility of a site is a function of the cost to access the site (e.g., travel cost) and other site attributes, such as expected catch rates, species available and the presence and severity of FCAs. All else equal, anglers get more utility from sites without FCAs. The model can be used to estimate the decline in value due to the presence of an FCA.

While the locations, methods, and valuation scenarios (i.e., type of affected species, number of sites) vary across these studies, the key takeaways are two-fold: 1) FCAs reduce recreational fishing values; and 2) the decline in value increases with the restrictiveness of the advisory (e.g., the lost value associated with a *Do Not Eat* FCA is greater than the loss associated with an *Eat No More Than One Meal Per Week* FCA).

[7] Note that, across these 12 states, approximately 68 percent of angling participants take part in freshwater fishing, and freshwater fishing accounts for 81 percent of all angling trips.

EXHIBIT 4. SELECTED ESTIMATES OF LOST VALUES ASSOCIATED WITH FCAS[A]

STUDY	LOCATION	LOST VALUE PER FISHING DAY AT SITE WITH A FCA (2019$)
Montgomery and Needelman (1997)	New York	Mixture of "Eat no more than one meal per month" and "Do not eat" FCAs: $34.34
Jakus *et al*. (1997)	Tennessee	Mixture of "Limited" and "Do not eat" FCAs: $25.49
Jakus *et al*. (1998)	Tennessee	Mixture of "Limited" and "Do not eat" FCAs: $24.14
MacNair and Desvousges (2007)	Lower Fox River/ Green Bay	"Limited" FCA: $3.37 "Do not eat" FCA: $11.56
Morey and Breffle (2006)	Lower Fox River/ Green Bay	Mixture of "Unlimited " and "Eat no more than one meal per week" FCAs: $4.04 Mixture of "Eat no more than one meal per month" and "Do not eat" FCAs: $33.78

Notes:

A. The lost values in this table are standardized by dividing the coefficient associated with FCAs by the coefficient associated with the travel cost variable. This standardization provides an estimate of the lost value conditional on choosing a site with a FCA. We refer to this estimate as the lost value per fishing day at a site with a FCA to distinguish it from the lost value per fishing day at any site. Without this adjustment, the lost values are not comparable, as they are affected by the relative importance of the sites that have advisories and by researchers' choices regarding the set of fishing trips to include in the model.

In extreme cases, contamination in fish can result in regulatory closures to recreational fishing (e.g., upper Hudson River from 1976-1994). In most cases, however, contamination results in the issuance of FCAs and anglers are able to continue accessing a contaminated waterbody if they wish. Since sites are not usually closed due to contamination in fish, anglers tend to lose a fraction of their total trip value rather than the entire trip value.

Exhibit 5 presents estimates of total trip values for recreational fishing to contextualize the estimates in Exhibit 4.[8] These estimates are derived from data generated by U.S. federal government agencies, and are broadly applied to a range of analyses used to support policy evaluations and environmental damage assessments. Combining the user day estimates from Exhibit 3 with the value per day estimates from Exhibit 5 yields an estimate in the billions of dollars (regardless of which value(s) is applied).

[8] To the extent that the reported estimates of trip values are for sites that have mercury advisories, either site specific or statewide, the value of these trips may be even greater.

For example, if we assume that the average fishing trip creates a value of $50 to the participant, the estimated economic welfare value of recreational fishing in the 12 states would be approximately $7.5 billion. This represents the full value of fishing across the 12 states that would be realized absent the effects of FCAs (see Exhibit 4). While we do not have information to precisely account for the effects of the MATS Rule on FCAs, and therefore on recreational fishing trip values, we consider the potential for the Rule to generate recreational fishing benefits on the order of $1 billion. Specifically, if the MATS Rule improves the value per recreational fishing trip by $6.70, the aggregate value of recreational fishing across the 12 states would be increased by approximately $1 billion. Given the effects of FCAs on the value of recreational fishing trips described in Exhibit 4 (ranging up to a reduction in $34 per trip), we find that it is reasonable that the benefits of the MATS Rule could easily be $6.70 per trip or greater. Thus, we expect that the MATS Rule results in recreational fishing benefits of $1 billion or more annually.

EXHIBIT 5. SELECTED STUDIES WITH ESTIMATES OF VALUE PER FISHING DAY

STUDY	SUMMARY	VALUE PER USER DAY (2019$)
Rosenberger (2016)	The Recreation Use Values Database (RUVD) summarizes literature on the value of outdoor recreation on public lands. It is the result of seven literature reviews dating back to 1984. The most recent review, sponsored by the USDA Forest Service, was completed in 2016 and contains nearly 3,200 value estimates in per person per activity day units. These estimates are based on over 400 studies of recreation activities in the U.S. and Canada from 1958 to 2015. The database provides value estimates for different activities by census region.	Northeastern U.S. Census Region, freshwater fishing: $83.81 Northeastern U.S. Census Region, saltwater fishing: $86.22 Midwestern U.S. Census Region, freshwater fishing: $50.25
USFWS (2016)	The addendum to the 2011 National Survey of Fishing Hunting and Wildlife-Associated Recreation contains economic values per fishing day by state for bass, trout, or walleye. The survey is conducted every five years by the US Census Bureau and sponsored by the United States Fish and Wildlife Service (USFWS). The 2016 survey did not contain these estimates due to budget constraints.	*Bass* Illinois: $51.58 Massachusetts: $31.40 Rhode Island: $15.70 *Trout* Connecticut: $33.64 Maine: $43.73 New Hampshire: $48.22 New Jersey: $21.31 New York: $65.04 Vermont: $30.28 *Walleye* Michigan: $16.82 Minnesota: $63.92 Wisconsin: $35.88

Lost Regional Economic Activity Associated with Recreational Fishing

While the preceding sections summarize impacts to recreational anglers themselves in the form of lost economic value, there are also negative consequences for regional economic activity when anglers take fewer trips or spend less on the trips they take due to FCAs (e.g., shorter trips). Expenditures on recreational fishing provide sales for businesses (e.g., bait shops, gear outfitters, gas stations), and in turn, these businesses make purchases from other firms in the region to support their operations. Furthermore, employees of these firms make additional purchases with their wages. The summation of these effects represents the total economic contribution of recreational activities to a region, which can be measured in terms of jobs and income, though other measures may be used. Estimates of the regional economic importance of the recreational fishing sector in select states is presented in the next section.

COMMERCIAL FISHING

As noted above, consumers have a range of sources of information on the risks posed by consuming mercury in fish and shellfish purchased in markets. While studies have not been published that estimate the change in demand for seafood products (or the price of these products), we would expect that efforts by some consumers to (1) limit the quantity of fish consumed, and/or (2) to substitute away from certain species of fish will impact both the quantity of fish demanded and the price obtained by this industry for some products. As discussed in the next section, landings of commercial fish and shellfish generate over $1.6 billion dollars in sales in the 12 states considered in this analysis. As such, even modest changes in market demand could have a significant impact on the income of harvesters and processors, with subsequent impacts on the economies of the 12 states considered in this report.

THE IMPORTANCE OF RECREATIONAL FISHING AND COMMERCIAL FISH AND SHELLFISH HARVEST AND PROCESSING IN THE NORTHEAST AND MIDWEST

To understand the potential benefits of reductions in mercury levels in fish and shellfish, we consider the regional economic importance of both recreational fishing behavior and commercial fish harvest and processing. Specifically, this analysis applies input-output multipliers along with publicly available data on recreational angling expenditures and commercial landings to evaluate the regional economic impacts associated with recreational fishing and commercial harvest in select states.

INPUT-OUTPUT MULTIPLIERS

The Regional Input-Output Modeling System (RIMS II or “RIMS”) applies a standard input-output modeling approach to analyze the economic impacts or multiplier effects associated with a change in demand within one or more sectors of the economy.[9] Developed by the U.S. Bureau of Economic Analysis, RIMS uses data on national input-output accounts to model the relationships and spending patterns between different industries. Based on these relationships, RIMS provides sector-specific and geographic-specific multipliers that evaluate how a change in economic activity (i.e., spending or demand) in one sector results in economic activity in other sectors within a geographic region (U.S. BEA 2013).

The RIMS multipliers translate changes in economic activity into economic impacts across four metrics: employment, earnings, value added, and output.

- **Employment**: This reflects a mix of full-time and part-time job-years (defined as one job lasting one year) that result from employment demand created by spending activity.
- **Earnings**: This captures all employment-related income received as part of the employment demand, including employee compensation and proprietor income.
- **Value Added**: This reflects the total value of all output or production, minus the cost of intermediate outputs (i.e., Gross Domestic Product).
- **Output**: This reflects the total value of all output or production, including the costs of intermediate and final outputs (i.e., sales).

This analysis applied RIMS Type II multipliers, which incorporate direct, indirect, and induced effects:

- **Direct Effects**: These are production changes that directly result from an activity or policy. In this analysis, the direct effects are equal to the recreational angling expenditures or commercial fish landings, which we allocate to appropriate economic sectors.
- **Indirect Effects**: The multiplier effects that result from changes in the output of industries that supply goods and services to those industries that are directly affected (i.e., impacts on the factors of production for the directly affected sectors).
- **Induced Effects**: Changes in household consumption arising from changes in employment and associated income that result from direct and indirect effects.

To understand these effects, consider an example where recreational anglers buy additional equipment from a local bait shop (direct effects). That bait shop may in turn increase its purchases of supplies from other businesses in the region to support its

[9] To conduct the input-output modeling, this analysis used state-specific RIMS Type II multipliers from the RIMS 2016 dataset, which was the most current version of these data that are publicly available.

operations (indirect effects). Employees benefiting from these increases in spending may then spend more themselves (induced effects).

RECREATIONAL FISHING

To analyze the regional economic impacts associated with recreational fishing, this analysis gathered recreational angling expenditure data from state-specific reports published as part of the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USFWS and U.S. Census Bureau 2018).[10] Exhibit 6 summarizes the annual recreational fishing expenditure data by state for trip-related, equipment-related, and total spending, as reported in the state-specific reports. All expenditure estimates have been converted to 2019 dollars using the Consumer Price Index.

EXHIBIT 6. ESTIMATES OF ANNUAL RECREATIONAL FISHING EXPENDITURES BY STATE (2019$)[11]

STATE	ANGLERS	ANNUAL TRIP-RELATED EXPENDITURES	ANNUAL EQUIPMENT-RELATED EXPENDITURES	ANNUAL TOTAL EXPENDITURES
Connecticut	342,000	$290,070,461	$199,384,964	$489,455,425
Illinois	1,044,000	$417,561,021	$673,245,251	$1,090,806,272
Massachusetts	532,000	$284,501,650	$226,181,643	$510,683,293
Maine	341,000	$240,746,226	$176,218,217	$416,964,443
Michigan	1,744,000	$1,225,379,517	$1,496,351,625	$2,721,731,141
Minnesota	1,562,000	$1,036,804,729	$1,670,513,217	$2,707,317,946
New Hampshire	228,000	$169,765,753	$64,070,482	$233,836,235
New Jersey	766,000	$546,091,107	$710,127,691	$1,256,218,798
New York	1,882,000	$1,186,333,921	$1,014,431,925	$2,200,765,845
Rhode Island	175,000	$94,123,671	$51,708,305	$145,831,976
Vermont	207,000	$101,202,991	$46,054,269	$147,257,259.99
Wisconsin	1,247,000	$681,205,982	$909,584,424	$1,590,790,406
Total	10,070,000	$6,273,787,028	$7,237,872,012	$13,511,659,041

[10] The 2011 report is the latest version to report state-specific values.

[11] The regional economic analysis in this report relies on recreational angling expenditure estimates broken out into detailed line items for trip-related, equipment-related, and other expenses (e.g., food, lodging, boating costs, artificial lures and flies). These reported disaggregated estimates by line item do not always sum to the total expenditure estimates for each state, as reported in Exhibit 6. For example, the detailed expenditure line items for Connecticut sum to 83 percent of the total recreational angling expenditures estimated for the state (91 percent for Illinois and New Hampshire; 92 percent for Vermont; 99 percent for Wisconsin; and approximately 100 percent for all other states). To the extent that the detailed expenditure data do not sum to the total recreational angling expenditure estimates for a state, this analysis may underestimate the regional economic impacts associated with recreational angling in that state.

In the appendix of each state-specific report, these total annual trip-related and equipment-related expenditures are broken down into more detailed expenditure line items. Trip-related spending categories include line items such as food, lodging, and transportation, while equipment-related categories include line items such as "reels, rods, and rod-making components" and "artificial lures and flies." This analysis mapped each of these detailed expenditure line items to corresponding RIMS sectors, which included industries defined as "food services and drinking places," "accommodations," and "other retail."

The analysis then applied state-specific and sector-specific RIMS multipliers to the corresponding state-by-state total spending amounts for each RIMS sector. These RIMS multipliers translate the expenditure amounts into estimates of regional economic impacts on employment demand, value added, and output.

Exhibit 7 summarizes the state-by-state results of this analysis. These regional economic impact estimates for recreational angling include direct, indirect, and induced effects.

EXHIBIT 7. ANNUAL REGIONAL ECONOMIC IMPACTS OF RECREATIONAL FISHING EXPENDITURES BY STATE (2019$)

STATE	EMPLOYMENT (JOBS)	EARNINGS ($)	VALUE ADDED ($)	OUTPUT ($)
Connecticut	6,666	$228,243,642	$460,834,368	$748,478,095
Illinois	19,983	$665,317,305	$1,305,284,266	$2,164,735,554
Massachusetts	8,842	$292,655,175	$593,491,314	$968,345,102
Maine	8,989	$239,954,740	$453,171,787	$739,109,734
Michigan	59,161	$1,697,413,376	$3,178,958,350	$5,240,046,989
Minnesota	55,065	$1,687,013,209	$3,239,786,409	$5,369,380,086
New Hampshire	3,538	$111,389,124	$230,329,220	$374,447,756
New Jersey	22,194	$754,204,825	$1,560,657,028	$2,557,479,074
New York	35,359	$1,196,860,993	$2,524,234,433	$4,105,442,367
Rhode Island	2,249	$71,039,141	$154,530,617	$251,997,610
Vermont	2,519	$68,381,808	$135,742,775	$222,127,681
Wisconsin	34,336	$944,406,087	$1,767,276,300	$2,924,547,680
Total	258,902	$7,956,879,425	$15,604,296,867	$25,666,137,726

The results suggest that the $13.5 billion in total annual recreational fishing expenditures across these 12 states generate total regional economic impacts of 258,902 full-time and part-time jobs, $8.0 billion in earnings, $15.6 billion in value added, and $25.7 billion in output (2019 dollars)

COMMERCIAL FISHING

To analyze the regional economic impacts associated with commercial fishing, this analysis gathered commercial seafood landings data published by the NOAA Fisheries, Fisheries Statistics Division (NOAA 2019). This NOAA division collects and publishes commercial landings data on a state-by-state basis, and has separate databases for ocean landings and Midwest landings.[12] We collected the most recent annual landings data from both databases, which consisted of 2017 estimates for ocean landings and 2016 estimates for Midwest landings. The estimated landings and values for Vermont are based on a white paper focused on the scope and value of commercial fish harvest and sales in Vermont.[13] Exhibit 8 summarizes the combined annual commercial landings by state in terms of whole weight (pounds) and dollar value. The dollar value estimates have been converted to 2019 dollars using the Consumer Price Index.

EXHIBIT 8. ESTIMATES OF ANNUAL COMMERCIAL FISH AND SHELLFISH LANDINGS BY STATE (2019$)

STATE	WHOLE WEIGHT (POUNDS)	DOLLAR VALUE ($)
Connecticut	10,118,122	$14,116,116
Illinois	No Data	No Data
Massachusetts	242,136,690	$622,841,959
Maine	208,677,144	$526,176,214
Michigan	6,200,910	$8,561,092
Minnesota	244,714	$225,037
New Hampshire	10,621,078	$36,028,922
New Jersey	198,601,927	$196,087,550
New York	24,904,141	$49,555,181
Rhode Island	84,107,764	$103,697,265
Vermont	459,432	$966,991
Wisconsin	2,670,112	$3,167,164
Total	788,742,034	$1,561,423,491

12 For the state-by-state breakdown, the "landings data do not indicate the physical location of harvest but the location at which the landings either first crossed the dock or were reported from" (NOAA 2019).

13 The estimates for Vermont account for 2012 landings and estimated value from January through September and, therefore, likely underestimate the total value of landings for that year. The values are adjusted to 2019 dollars using the Consumer Price Index. The white paper of landings and values in Vermont collected by the Vermont Department of Fish and Wildlife was provided to IEc on April 12, 2019.

This analysis mapped the dollar value of commercial fish and shellfish landings (i.e., total sales) to the corresponding RIMS sector of "fishing, hunting and trapping."[14] State-specific RIMS multipliers for this industry were then applied to the state-by-state annual commercial landings values. These RIMS multipliers translate the dollar value of landings into estimates of regional economic impacts on employment demand, value added, and output.

Exhibit 9 summarizes the state-by-state results of this analysis. These regional economic impact estimates for commercial fishing include direct, indirect, and induced effects.

The results suggest that the $1.6 billion in annual commercial fish landings for these 12 states generate total regional economic impacts of 17,794 full-time and part-time jobs, $700 million in earnings, $1.6 billion in value added, and $2.4 billion in output.

EXHIBIT 9. ANNUAL REGIONAL ECONOMIC IMPACTS OF COMMERCIAL FISH LANDINGS BY STATE

STATE	EMPLOYMENT (JOBS)	EARNINGS ($)	VALUE ADDED ($)	OUTPUT ($)
Connecticut	151	$6,415,775	$14,449,256	$22,320,402
Illinois	No Data	No Data	No Data	No Data
Massachusetts	6,495	$269,752,852	$627,762,410	$961,294,279
Maine	6,520	$250,617,731	$533,700,534	$823,991,952
Michigan	164	$4,288,251	$9,079,038	$14,303,016
Minnesota	4	$114,589	$244,885	$393,387
New Hampshire	No Data	No Data	No Data	$36,028,922
New Jersey	2,334	$98,710,472	$219,500,403	$347,388,703
New York	911	$22,047,100	$50,189,488	$77,206,972
Rhode Island	1,155	$45,906,779	$104,153,533	$160,544,105
Vermont	No Data	No Data	No Data	$966,991
Wisconsin	60	$1,536,708	$3,273,898	$5,151,392
Total	17,794	$699,390,257	$1,562,353,445	$2,449,590,123

RECREATIONAL AND COMMERCIAL FISHING

Recreational and commercial fishing activities in these 12 states generate significant regional economic activity. This analysis finds that the $12.0 billion in annual recreational fishing expenditures and the $1.6 billion in annual commercial fish landings for these 12 states result in a regional economic contribution of 276,696 full-time and part-time jobs, $8.7 billion in earnings, $17.2 billion in value added, and $28.1 billion in output. At this scale of economic activity, even small shifts in recreational fishing

[14] The primary economic activity within this sector is fish harvesting.

behavior or consumer purchasing as a result of elevated mercury concentrations could result in substantial economic impacts to related economic industries at the state or regional level. For example, if recreational anglers reduce their equipment- and trip-related expenditures by ten percent per year across the 12 states, the economic impact on value-added (equivalent to a GDP reduction) could be on the order of *$1.5 billion annually.*

ASSUMPTIONS, LIMITATIONS, AND CAVEATS

The following assumptions, limitations, and caveats apply to interpreting the results of this analysis:

- This analysis applied state-specific RIMS multipliers. As a result, it does not capture indirect and induced economic impacts that may have occurred outside each state (for example, if certain indirect or induced economic activity "leaked" beyond a state into neighboring states). To the extent that any economic activity produced by recreational or commercial fishing expenditures resulted in increases in regional economic activity outside each state, the output results may be understated.

- This analysis assumed that all sales and business activity related to commercial landings occurred within the state where landings were reported. In practice, commercial fishing businesses may operate in those states but be based in other states. For example, the analysis estimates that New Hampshire had approximately $36.0 million in commercial landings, but the RIMS multipliers suggest that did not generate any jobs, earnings, or value added for the state. Similarly, data from Vermont identify approximately $1 million in commercial landings, although the RIMS multipliers do not identify any associated indirect and induced impacts for the state. This may be because these economic impacts accrued to businesses that operate in New Hampshire and Vermont but are based in other states or that the U.S. Bureau of Economic Analysis (BEA) did not have sufficient industry-specific data to estimate the multiplier effects. In either case, the economic impact results reported may be understated for New Hampshire and Vermont.

IMPACTS OF FCAS TO HOUSING VALUES

Recent evidence demonstrates that mercury-based FCAs have a negative impact on property values. Tang *et al*. (2018) used the hedonic pricing method to estimate that New York State property values within one mile of an FCA-designated lake due to mercury decrease by an average of six to seven percent. The method uses property transaction data and information about various attributes of properties (i.e., size of house, quality of schools, proximity to open space for recreation and urban centers for work) to estimate a model that can be used to deduce the contribution of a given attribute to the sales price. Numerous published studies have estimated the impact of various measures of environmental quality on property values, though this is the only study we are aware of that estimates the impact of mercury-based FCAs on nearby property values. Since property values should capitalize the value of recreational opportunities, at least for occupants of the property, the estimates presented in Tang *et al*. (2018) should not be considered unique from the estimates of lost value to recreationists presented in a previous section, but as additional evidence that elevated mercury levels in fish have broad economic consequences.

WELL ACCEPTED AND WIDELY USED METHODS EXIST THAT EPA COULD USE TO QUANTIFY THE ECONOMIC BENEFITS ASSOCIATED WITH THE MATS RULE ON RECREATIONAL AND COMMERCIAL FISHERIES

As described above, there is ample evidence of the contribution of coal-fired EGUs to mercury levels in fish and shellfish. Elevated mercury levels lead to changes in consumer and recreator behavior, informed by state and federal health advisories and other information provided by non-governmental entities. These behavioral changes generate losses in consumer surplus and adverse impacts on regional economic activity.

In both EPA's 2011 Regulatory Impact Analysis (RIA) for the MATS Rule (U.S. EPA 2011) and the current proposed rule (U.S. EPA 2019) there was no attempt to quantify or monetize the social welfare or regional economic benefits resulting from changes in recreator or consumer behavior due to reductions in mercury emissions from the MATS Rule. Conversely, with the proposed rule, EPA has made no effort to account for the costs to states associated with changes in recreator and consumer behavior should EPA's reversal of its appropriate and necessary finding ultimately lead to abolishment of the standards (emissions limits) themselves, and a subsequent increase in mercury fish tissue concentrations.

Recreational and subsistence fishing as well as commercial fish harvest and processing play a substantial role in the economies and cultures of the Northeast and the Midwest. As such, even modest changes in mercury levels could have significant economic implications. Widely utilized and well accepted methods are available to place monetary values on the reduction in mercury concentrations in fish and shellfish that have and are expected to result from the MATS Rule. These are the same economic methods frequently applied by federal agencies bringing damage claims when acting as trustee for natural resources under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the1990 Oil Pollution Act, as well as the same methods widely used in the context of benefit analyses conducted under 316(b) of the Clean Water Act. Application of these methods to the MATS Rule would provide a more complete and transparent understanding of the actual benefits of the MATS Rule, and as such an understanding of the social and regional economic cost that would result from removing these requirements.

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APPENDIX A:

EXAMPLES OF GENERAL STATEWIDE SAFE FISH GUIDELINES

HEALTH ALERT

The Vermont Department of Health recommends that people limit eating some fish caught in Vermont waters.

These advisories are based on tests of fish caught in Vermont waters and scientific information about the harmful effects of mercury and, in the case of large lake trout in Lake Champlain and all fish in the Hoosic River, PCBs (polychlorinated biphenyls).

You can mix and match fish (you catch or buy) with the same limits, but once you meet the lowest limit eat no more fish that month. Do not eat the monthly limit within a single week.

Store bought fresh and canned fish—including tuna—have mercury levels that are about the same as many Vermont-caught fish. Add in store bought fish when you decide how many fish meals to eat each month.

One fish meal = 8 ounces uncooked fish

For more information call
1-800-439-8550
healthvermont.gov

VERMONT
DEPARTMENT OF HEALTH

	Women of childbearing age and children age 6 and under	Everyone else
GENERAL ADVISORY:		
Brown Bullhead Pumpkinseed	No more than 5 meals/month	No Restrictions
Walleye	0 Meals	No more than 1 meal/month
American Eel Chain Pickerel Lake Trout Smallmouth Bass	No more than 1 meal/month	No more than 3 meals/month
Largemouth Bass Northern Pike Yellow Perch (10 inches and larger)	No more than 2 meals/month	No more than 6 meals/month
Brook Trout Brown Trout Rainbow Trout White Perch Yellow Perch (smaller than 10 inches)	No more than 3-4 meals/month	No Restrictions
All Other Fish	No more than 2-3 meals/month	No more than 9 meals/month
SPECIAL ADVISORIES:		
Lake Carmi - Walleye	No more than 4 meals/month	No Restrictions
Lake Champlain Lake Trout (larger than 25 inches)	0 meals (includes all children under 15)	No more than 1 meal/month
Smallmouth Bass (19 inches and larger)	0 meals	No more than 1 meal/month
Yellow Perch (smaller than 10 inches)	No more than 5 meals/month	No Restrictions
Shelburne Pond Yellow Perch (smaller than 10 inches)	No more than 5 meals/month	No Restrictions
Hoosic River - All Fish	0 meals	0 meals
Deerfield Chain (Grout Pond, Somerset Reservoir, Harriman Reservoir, Sherman Reservoir, and Searsburg Reservoir)		
Brook Trout Brown Bullhead	No more than 5 meals/month	No Restrictions
Brown Trout (14 inches and smaller) Rainbow Smelt Rainbow Trout Rock Bass Yellow Perch	No more than 1 meal/month	No more than 3 meals/month
Brown Trout (larger than 14 inches) All Other Fish	0 meals	No more than 1 meal/month
15 Mile Falls Chain (Comerford Reservoir and Moore Reservoir)		
White Sucker	No more than 1 meal/month	No more than 3 meals/month
All Fish	0 meals	No more than 2 meals/month
15 Mile Falls Chain (McIndoes Reservoir)		
Yellow Perch	No more than 2 meals/month	No more than 6 meals/month
All Other Fish	No more than 1 meal/month	No more than 3 meals/month

v.May 2013

Statewide Safe Fish Guidelines

Michigan Department of Community Health

Use the Statewide Safe Fish Guidelines ONLY if:

STOP

- **your lake or river is not listed in the *Eat Safe Fish Guide*, OR**
- **your lake or river is listed in the *Eat Safe Fish Guide*, but the fish species is not listed.**

- Michigan is lucky to have over 11,000 lakes, rivers, and streams. Because of that huge number, it is not possible to test every fish species from every lake, river, or stream in the state.
- These general guidelines are based on the typical amount of chemicals found in fish filets tested from around the state. Some fish may be higher or lower.
- If any of these fish are listed in the *Eat Safe Fish Guide* for the lake or river you are fishing in, use those guidelines instead of the Statewide Safe Fish Guidelines. The *MI Servings* recommendation will be more exact for that lake or river because those filets have been tested.
- These general guidelines can be used for lakes, rivers, and fish species not included in the *Eat Safe Fish Guide*.

To get a free copy of the *Eat Safe Fish Guide*, visit www.michigan.gov/eatsafefish or call 1-800-648-6942.

eat safe fish

Michigan Department of Community Health

MDCH

Type of Fish	Chemical of Concern	Size of Fish (length in inches)	MI Servings per Month*
Black Crappie	Mercury	Any Size	4
Bluegill	Mercury	Any Size	8
Carp	PCBs	Any Size	2
Catfish	PCBs & Mercury	Any Size	4
Largemouth Bass	Mercury	Under 18"	2
		Over 18"	1
Muskellunge (Muskie)	Mercury	Any Size	1
Northern Pike	Mercury	Under 30"	2
		Over 30"	1
Rock Bass	Mercury	Any Size	4
Smallmouth Bass	Mercury	Under 18"	2
		Over 18"	1
Suckers	Mercury	Any Size	8
Sunfish	Mercury	Any Size	8
Walleye	Mercury	Under 20"	2
		Over 20"	1
White Crappie	Mercury	Any Size	4
Yellow Perch	Mercury	Any Size	4

See page 2 to learn about *MI Servings

What is *MI Serving*?

You can use the information below to find out how much fish is in a *MI Serving* ("my serving") for you. If you're planning on eating more than 1 *MI Serving* of fish at a single meal, aim to eat fish that are listed as 2-8 *MI Servings* per month to be sure you're within the safe range.

My Michigan, *MI Serving* Size

- ☑ 8 ounces of fish = size of an adult's hand (large oval)
- ☑ 4 ounces of fish = size of the palm of an adult's hand (small circle)
- ☑ 2 ounces of fish = size of half a palm of an adult's hand (rectangle)

How much is *MI Serving*?

Weight of Person	*MI Serving* Size
45 pounds	2 ounces
90 pounds	4 ounces
180 pounds	8 ounces

Weigh Less?

For every 20 pounds <u>less</u> than the weight listed in the table, subtract 1 ounce of fish.

For example, a 70 pound child's *MI Serving* size is 3 ounces of fish.
90 pounds - 20 pounds = 70 pounds
4 ounces - 1 ounce = a *MI Serving* size of 3 ounces

Weigh More?

For every 20 pounds <u>more</u> than the weight listed in the table, add 1 ounce of fish.

For example, a 110 pound person's *MI Serving* size is 5 ounces of fish.
90 pounds + 20 pounds = 110 pounds
4 ounces + 1 ounce = a *MI Serving* size of 5 ounces

Are you pregnant?

Fish is good for you and your baby! Use your pre-pregnancy weight to find your *MI Serving* size. It is best to avoid eating fish labeled as "Limited" if you're pregnant or breastfeeding.

About the Statewide Safe Fish Guidelines

- The Statewide Safe Fish Guidelines are set to provide safe options for everyone.
- They can be used by children, pregnant or breastfeeding women, and people who have health problems, like cancer, heart disease, or diabetes.
- The Statewide Safe Fish Guidelines can also be used by healthy adults to avoid getting too much of the chemicals in their bodies.
- Chemicals like PCBs and dioxins are linked to cancer, diabetes, and other illnesses.
- Mercury can cause damage to your brain, heart, and nerves.
- MDCH tests only the filet of the fish, and they use science-based calculations to find how much fish is safe to eat. With the Statewide Safe Fish Guidelines and the *Eat Safe Fish Guide*, everyone can now choose safer fish.

Questions? Please visit <u>www.michigan.gov/eatsafefish</u> or call 1-800-648-6942 for more information.

Freshwater Fish Consumption Advisory List

Massachusetts Department of Public Health
Bureau of Environmental Health
(617) 624-5757
November 2018

WATER BODY	TOWN(s)	FISH ADVISORY*	HAZARD*
Aaron River Reservoir	Cohasset, Hingham, Scituate	P1 (all species), P2 (CP, YP), P4	Mercury
Alewife Brook	Arlington, Belmont, Cambridge,Somerville	P1 (C), P3 (C)	PCBs
Ames Pond	Tewksbury	P1 (LMB), P3 (LMB)	Mercury
Ashland Reservoir	Ashland	P1 (all species), P5	Mercury
Ashley Lake	Washington	P1 (YP), P3 (YP)	Mercury
Ashfield Pond	Ashfield	P1 (LMB), P3 (LMB)	Mercury
Ashumet Pond	Mashpee, Falmouth	P1 (LMB), P3 (LMB)	Mercury
Atkins Reservoir	Amherst, Shutesbury	P1 (all species), P5	Mercury
Attitash, Lake	Amesbury, Merrimac	P1 (all species), P2 (LMB), P4	Mercury
Badluck Lake	Douglas	P6	Mercury
Baker Pond	Brewster, Orleans	P1 (YP), P3 (YP)	Mercury
Baldpate Pond	Boxford	P1 (all species), P2 (LMB), P4	Mercury
Ballardvale Impoundment of Shawsheen River	Andover	P1 (LMB & BC), P3 (LMB & BC)	Mercury
Bare Hill Pond	Harvard	P1 (LMB), P3 (LMB)	Mercury
Bearse Pond	Barnstable	P1 (LMB, SMB), P3 (LMB, SMB)	Mercury
Beaver Pond	Bellingham, Milford	P1 (CP, LMB), P3 (CP, LMB)	Mercury
Big Pond	Otis	P1 (all species), P2 (LMB), P4	Mercury
Boon, Lake	Hudson, Stow	P1 (LMB & BC), P3 (LMB & BC)	Mercury
Box Pond	Bellingham, Mendon	P1 (WS), P2 (WS)	DDT
Bracket Reservoir (Framingham Reservoir #2) – See Sudbury River			
Browning Pond	Oakham, Spencer	P1 (LMB, YP), P3 (LMB, YP)	Mercury
Buckley Dunton Lake	Becket	P1 (LMB), P3 (LMB)	Mercury
Buffomville Lake	Charlton, Oxford	P1 (all species), P5	Mercury
Burr's Pond	Seekonk	P1 (LMB), P3 (LMB)	Mercury
Cabot Pond – See Rumford River			
Canton River (between the Neponset River and Neponset Street dam)	Canton	P1 (all species), P2 (AE, WS), P4	PCBs, DDT
Cedar Swamp Pond	Milford	P1 (all species), P5	Mercury
Chadwicks Pond	Boxford, Haverhill	P6	Mercury
Charles River (between the South Natick Dam in Natick and the Museum of Science Dam in Boston/ Cambridge)	Boston, Cambridge, Dedham, Dover, Natick, Needham, Newton, Watertown, Wellesley, Weston, Waltham	P1 (C, LMB), P2 (C), P3 (LMB)	PCBs, Pesticides
Charles River (between the Medway Dam in Franklin and Medway and the South Natick Dam in Natick)	Dover, Franklin, Medfield, Medway, Millis, Natick, Norfolk, Sherborn	P1 (all species), P5	Mercury, Chlordane, DDT
Chebacco Lake	Essex, Hamilton	P1 (LMB), P3 (LMB)	Mercury
Clay Pit Pond	Belmont	P6	Chlordane
Cochato River, Ice Pond and Sylvan Lake	Randolph, Holbrook, Braintree	P1 (all species), P2 (BB & C & AE), P4	Pesticides
Cochichewick, Lake	North Andover	P1 (LMB, SMB), P3 (LMB, SMB)	Mercury
Cochituate, Lake (including Middle, North, South, and Carling Basins)	Framingham, Natick, Wayland	P1 (all species), P2 (AE)	PCBs

* See page 7 for codes.

1

WATER BODY	TOWN(s)	FISH ADVISORY*	HAZARD*
Concord River (from confluence with Sudbury and Assabet Rivers to the Faulkner Dam in Billerica)	Concord, Carlisle, Bedford, Billerica	P1 (all species), P2 (LMB), P4	Mercury
Connecticut River	Entire length of Massachusetts, including all towns from Northfield through Longmeadow	P1 (all species), P2 (CC & WC & AE & YP)	PCBs
Copicut Reservoir	Dartmouth, Fall River	P6	Mercury
Copicut River	Dartmouth, Fall River	P1 (all species), P2 (AE), P3 (LMB)	PCBs, Mercury
Cornell Pond	Dartmouth	P1 (all species), P2 (AE), P3 (LMB)	PCBs, Mercury
Crystal Lake	Haverhill	P1 (all species), P2 (LMB), P4	Mercury
Damon Pond	Chesterfield, Goshen	P1 (CP, LMB), P3 (CP, LMB)	Mercury
Dennison, Lake	Winchendon	P1 (LMB), P3 (LMB)	Mercury
Dodgeville Pond - See Mechanics Pond			
Drinkwater River/ Indian Head River/North River (Betweeen the Forge Pond Dam in Hanover and Route 3 in Norwell/ Pembroke) and Factory Pond	Hanson, Hanover, Norwell, Pembroke	P6	Mercury
Duck Pond	Wellfleet	P6	Mercury
Dyer Pond	Wellfleet	P6	Mercury
East Brimfield Reservoir	Brimfield, Sturbridge	P1 (all species), P5	Mercury
East Monponsett Pond	Halifax	P1 (LMB), P3 (LMB)	Mercury
Echo Lake	Hopkinton, Milford	P1 (all species), P2 (LMB), P4	Mercury
Factory Pond - See Drinkwater River			
Fall Brook Reservoir	Leominster	P1 (all species), P5	Mercury
Farrar Pond	Lincoln	P1 (BC, CP, LMB), P3 (BC, CP, LMB)	Mercury
Flax Pond	Lynn	P1 (AE, WP), P2 (AE)	DDT, Chlordane
Flint Pond	Tyngsborough	P1 (all species), P2 (LMB), P4	Mercury
Forest Lake	Methuen	P1 (LMB), P3 (LMB)	Mercury
Forge Pond	Littleton, Westford	P1 (LMB), P3 (LMB)	Mercury
Fort Meadow Reservoir	Hudson, Marlborough	P1 (WS), P3 (WS)	Chlordane
Foster Pond	Swampscott	P1 (AE), P2 (AE)	DDT
Fosters Pond	Andover, Wilmington	P1 (all species), P5	Mercury
Freeman Lake – See Newfield Pond			
French River (Between the Hodges Village Dam in Oxford and the North Webster Village Pond Dam in Webster)	Oxford, Webster	P1 (all species), P2 (LMB), P4	Mercury
Fulton Pond - See Rumford River			
Gales Pond	Warwick	P1 (YP), P3 (YP)	Mercury
Garfield, Lake	Monterey	P1 (LMB), P3 (LMB)	Mercury
Gibbs Pond	Nantucket	P1 (all species), P5	Mercury
Goodrich Pond	Pittsfield	P6	PCBs
Great Herring Pond	Bourne, Plymouth	P1 (SMB), P3 (SMB)	Mercury
Great Pond	Truro	P1 (all species), P5	Mercury
Great Pond	Wellfleet	P6	Mercury
Great South Pond	Plymouth	P1 (all species), P5	Mercury
Grove Pond	Ft. Devens, Ayer	P6	Mercury
Haggetts Pond	Andover	P1 (all species), P2 (LMB), P4	Mercury
Hamblin Pond	Barnstable	P1 (SMB), P3 (SMB)	Mercury
Hardwick Pond	Hardwick	P1 (LMB), P3 (LMB)	Mercury
Heard Pond	Wayland	P6	Mercury
Heart Pond	Chelmsford, Westford	P1 (LMB), P3 (LMB)	Mercury
Hickory Hills Lake	Lunenburg	P1 (all species), P5	Mercury

2

WATER BODY	TOWN(s)	FISH ADVISORY*	HAZARD*
Hocomonco Pond	Westborough	P6	PAHs
Holland Pond	Brimfield, Holland, Sturbridge	P1 (all species), P5	Mercury
Hood (or Hoods) Pond	Topsfield, Ipswich	P1 (all species), P2 (LMB, YP), P4	Mercury
Hoosic River (from the channelized section in North Adams to the MA/VT state line)	N. Adams, Williamstown	P6	PCBs
Horn Pond	Woburn	P1 (LMB), P3 (LMB)	DDT
Horseleech Pond	Truro	P1 (LMB), P3 (LMB)	Mercury
Hovey's Pond	Boxford	P1 (all species), P5	Mercury
Housatonic River (See footnote 1)	All towns from Dalton through Sheffield	P6 (also includes frogs and turtles)	PCBs
Ice Pond – See Cochato River			
Indian Head River – See Drinkwater River			
Ipswich River (between the Bostik Findley Dam in Middleton and the Sylvania Dam in Ipswich)	Boxford, Danvers, Hamilton, Ipswich, Middleton, Peabody, Topsfield, Wenham	P1 (all species), P5	Mercury
Johns Pond	Mashpee	P1 (all species), P2 (SMB), P4	Mercury
Johnsons Pond	Groveland, Boxford	P1 (LMB), P3 (LMB)	Mercury
Kenoza Lake	Haverhill	P6	Mercury
Kingman Pond – See Rumford River			
Knops Pond	Groton	P1 (LMB), P3 (LMB)	Mercury
Konkapot River (From the Mill River Dam in New Marlborough to its confluence with the Housatonic River)	Sheffield, New Marlborough	P1 (all species), P5	Mercury
Lakes whose names begin with "Lake" are listed under the second word in their name (so that Lake Pentucket is listed under "Pentucket," etc.)			
Lashaway, Lake	North Brookfield, East Brookfield	P1 (LMB, SMB), P3 (LMB, SMB)	Mercury
Lawrence Pond	Sandwich	P1 (LMB), P3 (LMB)	Mercury
Leverett Pond	Boston, Brookline	P1 (C), P2 (C)	DDT
Lewin Brook Pond	Swansea	P1 (BC, LMB), P3 (BC, LMB)	Mercury
Little Chauncy Pond	Northborough	P1 (BC, LMB), P3 (BC, LMB)	Mercury
Locust Pond	Tyngsborough	P1 (all species), P5	Mercury
Long Pond	Brimfield, Sturbridge	P1 (all species), P5	Mercury
Long Pond	Dracut, Tyngsboro	P1 (all species), P5	Mercury
Long Pond	Rutland	P1 (all species), P5	Mercury
Long Pond	Wellfleet	P6	Mercury
Long Pond (Rochester) – See Snipituit Pond			
Lost Lake	Groton	P1 (LMB), P3 (LMB)	Mercury
Lowe Pond	Boxford	P1 (all species), P2 (LMB), P4	Mercury
Lowell Canals (see footnote 2)	Lowell	P1 (all species), P2 (AE), P4	Mercury, Lead, PCBs, DDT
Lower Mystic Lake	Arlington, Medford	P1 (WS), P2 (WS)	PCBs, DDT
Malden River	Everett, Malden, Medford	P6	PCBs, Chlordane, DDT
Manchaug Pond	Douglas, Sutton	P1 (LMB), P3 (LMB)	Mercury
Martins Pond	North Reading	P1 (LMB & BC & YP), P3 (LMB & BC& YP)	Mercury
Mashpee Pond	Mashpee, Sandwich	P1 (SMB), P3 (SMB)	Mercury
Massapoag Lake	Sharon	P1 (LMB), P3 (LMB)	Mercury
Massapoag Pond	Dunstable, Groton, Tyngsboro	P1 (all species), P5	Mercury

1 Fish taken from feeder streams to the Housatonic River should be trimmed of fatty tissue prior to cooking.
2 For Lowell Canals, the public is advised to consume only the fillet of those species not specifically listed in the advisory.

WATER BODY	TOWN(s)	FISH ADVISORY*	HAZARD*
Mechanics Pond, Dodgeville Pond, and the section of the Ten Mile River that connects them	Attleboro	P1 (WP), P3 (WP)	Chlordane
Merrimack River (from the MA/NH state line to Broadway Dam in Lawrence)	All towns from Tyngsborough through Lawrence	P1 (WS & LMB), P3 (WS & LMB)	Mercury
Miacomet Pond	Nantucket	P1 (all species), P2 (WP), P4	Mercury
Mill Pond	Burlington	P1 (LMB), P3 (LMB)	Mercury
Mill Pond (SuAsCo Reservoir) above GH Nichols Dam	Westborough	P1 (all species), P2 (LMB)	Mercury
Mill River	Hopedale	P1 (all species), P5	PCBs
Millers River and its tributaries (between the confluence with the Otter River in Winchendon and the Connecticut River in Erving/Montague)	Athol, Erving, Montague, Orange, Phillipston, Royalston, Wendell, Winchendon	P1 (all species), P2 (AE, BT), P4	PCBs
Millvale Reservoir	Haverhill	P1 (all species), P2 (LMB)	Mercury
Mirror Lake	Ft. Devens, Harvard	P1 (LMB), P3 (LMB)	Mercury
Monomonac, Lake and the North branch of Millers River (Between the outlet of Lake Monomonac and the inlet of Whitney Pond)	Winchendon	P1 (all species), P5	Mercury
Moores Pond	Warwick	P1 (AE, CP), P3 (AE, CP)	Mercury
Morewood Lake	Pittsfield	P6	PCBs
Mother Brook (between Charles River and Knight Street Dam)	Dedham, Boston	P1 (C, LMB, WS), P3 (C, LMB, WS)	Mercury, DDT
Mother Brook (between the Knight Street Dam and the Neponset River)	Boston	P1 (all species), P2 (AE, WS), P4	PCBs, DDT
Muddy River	Boston, Brookline	P1 (all species), P2 (BB & C & AE), P4	PCBs
Mystic River (between outlet of Lower Mystic Lake and Amelia Earhart Dam)	Arlington, Everett, Medford, Somerville	P6	PCBs, Chlordane, DDT
Nabnasset Pond	Westford	P1 (LMB), P3 (LMB)	Mercury
Neponset River (between the Hollingsworth & Vose Dam in Walpole and the Walter Baker Dam in Boston)	Boston, Canton, Dedham, Milton, Norwood, Sharon, Walpole, Westwood	P1 (all species), P2 (AE, WS), P4	PCBs, DDT
New Bedford Reservoir	Acushnet	P1 (AE, LMB), P3 (AE, LMB)	Mercury, DDT
Newfield Pond (= Freeman Lake)	Chelmsford	P1 (LMB), P3 (LMB)	Mercury
Nippenicket, Lake	Bridgewater, Raynham	P1 (all species), P2 (LMB), P4	Mercury
Noquochoke Lake	Dartmouth	P1 (all species), P2 (LMB & AE), P4	Mercury, PCBs
North River – see Drinkwater River			
Norton Reservoir – See Rumford River			
Nutting Lake	Billerica	P1 (all species), P5	Mercury
Otis Reservoir	Otis, Tolland	P1 (all species), P5	Mercury
Otter River (between the Seaman Paper Dam in Templeton and the confluence with the Millers River in Winchendon)	Templeton, Winchendon	P1 (all species), P2 (BB & WS), P4	PCBs
Pelham Lake	Rowe	P1 (LMB), P3 (LMB)	Mercury
Pentucket Pond	Georgetown	P1 (all species), P2 (LMB & BC), P4	Mercury
Pentucket, Lake	Haverhill	P6	Mercury
Pepperell Pond	Pepperell, Groton	P1 (all species), P2 (LMB), P4	Mercury
Peters Pond	Sandwich	P1 (all species), P5	Mercury
Pettee Pond	Walpole, Westwood	P1 (LMB), P3 (LMB)	Mercury
Plainfield Pond	Plainfield	P1 (LMB), P3 (LMB)	Mercury
Pleasant Pond	Hamilton, Wenham	P1 (LMB), P3 (LMB)	Mercury
Plowshop Pond	Ft. Devens, Ayer	P6	Mercury
Pomps Pond	Andover	P1 (all species), P2 (LMB), P4	Mercury

WATER BODY	TOWN(s)	FISH ADVISORY*	HAZARD*
Ponkapoag Pond	Canton, Randolph	P1 (all species), P5	Mercury
Pontoosuc Lake	Pittsfield, Lanesborough	P1 (LMB), P3 (LMB)	Mercury
Populatic Pond	Franklin, Medway, Norfolk	P1 (all species), P5	Mercury, Chlordane, DDT
Powder Mill Pond	Barre	P1 (all species), P5	Mercury
Puffer Pond	Ft. Devens Sudbury Training Annex, Maynard	P6	Mercury
Quabbin & Wachusett Reservoirs (See footnote 3)	New Salem, Shutesbury, Petersham, Hardwick, Ware, Pelham, Belchertown, Boylston, West Boylston, Sterling, Clinton	See footnote 3	Mercury
Quaboag Pond	E. Brookfield, Brookfield	P1 (all species), P2 (LMB), P4	Mercury
Quannapowitt, Lake	Wakefield	P1 (C), P3 (C)	DDT
Quinebaug River (from dam at Hamilton Reservoir through East Brimfield Reservoir/Long Pond, including Holland Pond)	Brimfield, Holland, Sturbridge	P1 (all species), P5	Mercury
Red Bridge Pond	Wilbraham	P1 (BC, LMB), P3 (BC, LMB)	Mercury
Reservoir #6	Sutton	P1 (all species), P5	Mercury
Reservoir Pond	Canton	P1 (LMB, WP), P3 (LMB, WP)	Mercury
Rice City Pond	Northbridge, Uxbridge	P1 (all species), P2 (C, WS), P4	PCBs, DDT
Riverdale Pond	Northbridge	P1 (all species), P5	PCBs
Rock Pond	Georgetown	P1 (all species), P2 (LMB), P4	Mercury
Rohunta, Lake (Middle, North, and South Basins)	Orange, Athol, New Salem	P1 (all species), P5	Mercury
Rolling Dam Impoundment	Blackstone	P1 (all species), P2 (C, WS), P4	PCBs, DDT
Round Pond East	Truro	P1 (all species), P2 (LMB), P4	Mercury
Round Pond West	Truro	P1 (YP), P3 (YP)	Mercury
Rumford River (from Glue Factory Pond Dam; Fulton, Kingman, & Cabot ponds; Norton reservoir)	Foxborough, Mansfield, Norton	P6	Dioxin, Pesticides
Ryder Pond	Truro	P6	Mercury
Saltonstall, Lake	Haverhill	P1 (LMB), P3 (LMB)	Mercury
Sampsons Pond	Carver	P1 (BB, WP), P3 (BB, WP)	Mercury, DDT
Sargent Pond	Leicester	P1 (LMB), P3 (LMB)	Mercury
Sawdy Pond	Fall River, Westport	P1 (LMB), P3 (LMB)	Mercury
Shawsheen River - See Ballardvale Impoundment			
Sheep Pond	Brewster	P1 (all species), P5	Mercury
Sherman Reservoir	Rowe, Monroe	P1 (all species), P2 (YP), P4	Mercury
Shirley Lake	Lunenburg	P1 (all species), P5	Mercury
Silver Lake	Pittsfield	P6	PCBs
Silver Lake	Wilmington	P1 (LMB, YB), P3 (LMB, YB)	Mercury, DDT
Slough Pond	Truro	P1 (all species), P2 (LMB), P4	Mercury
Snake Pond	Sandwich	P1 (all species), P2 (SMB), P4	Mercury
Snipituit Pond and Long Pond	Rochester	P1 (BC & LMB), P3 (BC & LMB)	Mercury
Snow Pond	Truro	P1 (LMB), P3 (LMB)	Mercury

3 Children younger than 12 years, pregnant women, and nursing women should not consume fish except for lake trout less than 24 inches long and salmon. All other people should not eat smallmouth bass, largemouth bass, or lake trout greater than 24 inches long; may eat unlimited amounts of salmon and lake trout less than 24 inches long; and should limit consumption of all other Quabbin and Wachusett Reservoir fish species to one five-ounce meal per week.

WATER BODY	TOWN(s)	FISH ADVISORY*	HAZARD*
South Pond (= Quacumquasit Pond)	Sturbridge, Brookfield, E. Brookfield	P1 (all species), P5	Mercury
Spectacle Pond	Sandwich	P1 (all species), P5	Mercury
Spectacle Pond	Wellfleet	P1 (YP), P3 (YP)	Mercury
Spicket River - See Stevens Pond & Spicket River			
Spy Pond	Arlington	P1 (C), P2 (C)	DDT, Chlordane
Stern Reservoir (Framingham Reservoir #1) – See Sudbury River			
Stevens Pond & Spicket River (from Stevens Pond to Music Hall Dam in Methuen)	Lawrence, Methuen	P1 (C, LMB, WS), P3 (C, LMB, WS)	Mercury, DDT
Stevens Pond	North Andover	P1 (LMB), P3 (LMB)	Mercury
Stockbridge Bowl	Stockbridge	P1 (LMB), P3 (LMB)	Mercury
Sudbury Reservoir	Marlborough, Southborough	P1 (all species), P2 (Bass)	Mercury
Sudbury River (from Ashland to its confluence with the Assabet and Concord Rivers), Stern Reservoir, and Bracket Reservoir	All towns from Ashland through Concord	P6	Mercury
Sylvan Lake – See Cochato River			
Ten Mile River – see Mechanics Pond			
Texas Pond (= Thayer Pond)	Oxford	P1 (LMB), P3 (LMB)	Mercury
Thayer Pond – see Texas Pond			
Tom Nevers Pond	Nantucket	P1 (all species), P5	Mercury
Turner Pond	Dartmouth, New Bedford	P1 (all species), P5	Mercury
Upper Naukeag Lake	Ashburnham	P1 (all species), P2 (LMB, SMB), P4	Mercury
Upper Reservoir	Westminster	P1 (all species), P2 (LMB), P4	Mercury
Wachusett Lake	Princeton, Westminster	P1 (LMB), P3 (LMB)	Mercury
Wachusett Reservoir – See Quabbin Reservoir			
Waite Pond	Leicester	P1 (all species), P2 (CP), P4	Mercury
Wakeby Pond	Mashpee, Sandwich	P1 (SMB), P3 (SMB)	Mercury
Walden Pond	Concord	P1 (LMB & SMB), P3 (LMB & SMB)	Mercury
Walden Pond	Lynn, Lynnfield, Saugus	P1 (LMB), P3 (LMB)	Mercury
Wampanoag, Lake	Ashburnam, Gardner	P1 (all species), P5	Mercury
Warner's Pond	Concord	P1 (LMB), P3 (LMB)	Mercury
Wenham Lake	Beverly, Wenham	P1 (all species), P2 (AE, LMB), P4	Mercury, DDT
Wequaquet Lake	Barnstable	P1 (LMB, SMB), P3 (LMB, SMB)	Mercury
West Monponsett Pond	Halifax, Hanson	P1 (LMB), P3 (LMB)	Mercury
Whitehall Reservoir	Hopkinton	P1 (all species), P2 (YB), P4	Mercury
Whitings Pond	North Attleborough, Plainville	P1 (B, LMB), P3 (B, LMB)	Mercury
Whitmans Pond	Weymouth	P1 (AE), P2 (AE)	DDT
Whitney Pond	Winchendon	P1 (all species), P2 (CP), P4	Mercury
Windsor Lake	Windsor	P1 (LMB), P2 (LMB)	Mercury
Willet Pond	Walpole, Norwood, Westwood	P1 (LMB), P3 (LMB)	Mercury
Winthrop, Lake	Holliston	P6	Dioxin
Wrights Reservoir	Gardner, Westminster	P1 (all species), P5	Mercury

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Advice Codes

P1 (all species)	Children younger than 12 years or age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any fish from this water body.
P1 (species)	Children younger than 12 years or age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any of the affected fish species (in parenthesis) from this water body.
P2 (species)	The general public should not consume any of the affected fish species (in parenthesis) from this water body.
P3 (species)	The general public should limit consumption of affected fish species (in parenthesis) to two meals per month.
P4	The general public should limit consumption of non-affected fish from this water body to two meals per month.
P5	The general public should limit consumption of all fish from this water body to two meals per month.
P6	No one should consume any fish from this water body.

Fish Codes

AE	American Eel	CCS	Creek C hubsucker	SMB	Smallmouth Bass
B	Bluegill	CP	Chain Pickerel	WC	White Catfish
BB	Brown Bullhead	FF	Fallfish	WP	White Perch
BC	Black Crappie	GRS	Green Sunfish	WS	White Sucker
BT	Brown Trout	LMB	Largemouth Bass	YB	Yellow Bullhead
C	Carp	LNS	Longnose Sucker	YP	Yellow Perch
CB	Calico Bass	P	Pumpkinseed		
CC	Channel Catfish	RT	Rainbow Trout		

Hazard Codes

PCB=polychlorinated biphenyls
PAHs=polycyclic aromatic hydrocarbons

7

Exhibit B

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Re: Supplemental Comments on "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," RIN: 2060-AV12, Doc. ID No. EPA–HQ–OAR–2018–0794

Dear Director Sasser and Mr. Hutson:

Thank you to you and your Environmental Protection Agency ("EPA") colleagues for meeting on June 9, 2021 with representatives of the Attorney General's Offices of Massachusetts, California, and New York, along with our public health and environmental organization partners, to discuss EPA's review of the final action entitled "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," 85 Fed. Reg. 31,286 (May 22, 2020) ("Revised Finding"). We appreciated the opportunity to discuss the significant and continuing public health, environmental, and economic benefits of the national hazardous air pollutant emissions limitations for power plants, commonly known as the Mercury and Air Toxics Standards or "MATS Rule," 77 Fed. Reg. 9304 (Feb. 16, 2012), and the urgent need for EPA to reverse its unlawful Revised Finding.[1]

As we mentioned at our meeting, compliance with the MATS Rule has generated enormous reductions in hazardous air pollutant emissions that are vital to protecting public health and the environment and leveling the regulatory playing field across the country. Power-plant mercury emissions, for instance, declined eighty-six percent between 2006 and 2017, mainly as a result of the MATS Rule and other emissions-control policies. 84 Fed. Reg. 2670, 2689 tbl.4 (Feb. 7, 2019).

As we discussed, a wide array of studies and data published since the MATS Rule was promulgated demonstrate that the Rule's environmental, health, and economic benefits are substantially greater than initially anticipated, and that the costs of the MATS Rule are lower than originally estimated. These data confirm that the MATS Rule's benefits far exceed its costs. For your reference and consideration, below please find a compilation of notable post-2011 sources that are relevant to assessing the benefits and costs of the MATS Rule, including sources regarding: fisheries and aquatic systems, human health and welfare, and compliance costs.

POST-2011 SOURCES RELEVANT TO THE BENEFITS AND COSTS OF THE MATS RULE FOR EPA'S CONSIDERATION

Fisheries and Aquatic Systems

Robert E. Unsworth et al., Industrial Economics, Inc., *The Economic Benefits of the Mercury and Air Toxics Standards (MATS) Rule to the Commercial and Recreational Fishery Sectors of Northeast and Midwest States* (2019), Doc. ID No. EPA–HQ–OAR–2018–0794–1175 Att. 2.

> Concluding that the MATS Rule has reduced mercury loadings to aquatic ecosystems and reduced mercury levels in recreationally caught and commercially harvested fish. "Given the importance of recreational fishing and the commercial fishing and processing sectors to the economies of the Northeast and Midwest, even modest changes in recreator and consumer behavior in response to reductions in mercury concentrations from the MATS Rule are likely to result in substantial benefits to the economies and residents of these states and the Nation as a whole. . . . [I]t is reasonable to conclude that the Rule may generate recreational and commercial fishing benefits in excess of $1 billion *annually*." Finding also that "[t]here are

[1] *See* Comments of the Attorneys General of Massachusetts, et al. on EPA's Proposed "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," 84 Fed. Reg. 2670 (Feb. 7, 2019) (Apr. 17, 2019), Doc. ID No. EPA–HQ–OAR–2018–0794–1175 (arguing that EPA's action to revise its prior finding that regulation of power-plant hazardous air pollutants is "appropriate and necessary" is unlawful and *ultra vires*).

widely accepted methods that EPA could have used to monetize the benefits of reduced mercury concentrations in recreationally caught and commercially harvested fish. These benefits would include both regional economic performance (including jobs and expenditures) as well as social welfare benefits."

Elsie M. Sunderland, Miling Li, & Kurt Bullard, *Decadal Changes in the Edible Supply of Seafood and Methylmercury Exposure in the United States*, 126(1) Envtl. Health Perspectives 017006-1 (2018), https://ehp.niehs.nih.gov/doi/pdf/10.1289/EHP2644.

Estimating the geographic origins of seafood consumed in the United States and how shifts in edible supply impacted methylmercury exposures. Finding that "[c]oastal ecosystems account for 37% of U.S. population-wide MeHg intake and can be expected to respond to domestic efforts to curb mercury pollution."

Christopher R. DeSorbo et al. *Mercury Concentrations in Bald Eagles Across an Impacted Watershed in Maine, USA*, 627 Sci. of the Total Env't 1515 (2018), https://www.ncbi.nlm.nih.gov/pubmed/30857113.

Finding that bald eagles in interior Maine and in the Catskill Park region of southeastern New York State are commonly exposed to mercury, primarily from atmospheric deposition, at concentrations associated with neurological and reproductive impacts in birds.

Cheng-Shiuan Lee et al., *Declining Mercury Concentrations in Bluefin Tuna Reflect Reduced Emissions to the North Atlantic Ocean*, 50(23) Sci. & Tech. 12,825 (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5161346/.

Finding that mercury concentrations in bluefin tuna from the Northwest Atlantic "declined significantly" at a rate of 19% from 2004 to 2012. The decrease paralleled declining mercury emissions in North America and reductions in North Atlantic atmospheric mercury concentrations, demonstrating connection between efforts to reduce mercury emissions and meaningfully lower mercury concentrations in commercially important fish.

Ford A. Cross et al., *Decadal Declines of Mercury in Adult Bluefish (1972-2011) from the Mid-Atlantic Coast of the U.S.A.*, 49 Envtl. Sci. Tech. 9064 (2015), https://pubmed.ncbi.nlm.nih.gov/26148053/.

Measuring concentrations of total mercury in adult bluefish collected in 2011 off North Carolina and comparing those measurements with similar measurements made in 1972. Finding that mercury levels decreased by 43% between 1972 and 2011, similar to the estimated reductions of mercury observed in atmospheric deposition and aquatic ecosystems over that time. Also citing additional studies conducted between 1973 and 2007 that confirm a correlation between lower mercury levels in bluefish and decreasing U.S. mercury air emissions, and concluding that reduced mercury emissions have likely resulted in reduced human mercury exposures.

Ryan F. Lepak et al., *Use of Stable Isotope Signatures to Determine Mercury Sources in the Great Lakes*, 2(12) Envtl. Sci. & Tech. Letters 335 (2015), https://pubs.acs.org/doi/abs/10.1021/acs.estlett.5b00277.

Identifying three primary sources of mercury in Great Lakes sediment: atmospheric, industrial, and watershed-derived. Findings suggest "that atmospheric sources, rather than contaminated historical sediments, may be an important source of bioaccumulative Hg in Great Lakes fish."

Michael S. Hutcheson et al., *Temporal and Spatial Trends in Freshwater Fish Tissue Mercury Concentrations Associated with Mercury Emissions Reductions*, 48 Envtl. Sci. Tech. 2193 (2014), https://www.ncbi.nlm.nih.gov/pubmed/24494622.[2]

Analyzing mercury concentrations monitored from 1999 to 2011 in largemouth bass and yellow perch in 23 lakes in Massachusetts during a significant period of reductions in local and regional mercury emissions. Finding that average tissue mercury concentration in largemouth bass decreased 44% in most lakes in a regional mercury "hotspot" area, and average tissue mercury concentration in yellow perch in all sampled lakes in the same area decreased 43%. During a similar time period, mercury emissions from major point sources decreased 98% in the hotspot area, and 93% in the rest of the state, demonstrating a correlation between emissions reductions and decreased mercury concentrations in aquatic species.

Paul E. Drevnick et al., *Spatial and Temporal Patterns of Mercury Accumulation in Lacustrine Sediments across the Laurentian Great Lakes Region*, 161 Envtl. Pollution 252 (2012), https://surface.syr.edu/cie/6/.[3]

Analyzing core sediment samples from the Great Lakes and nearby lakes to assess historical and recent changes in mercury deposition. Finding that sedimentary mercury is declining in the region and that "atmospheric Hg deposition appears uniform across the Great Lakes airshed," which "suggests that local and regional sources of atmospheric Hg emissions are important sources of Hg deposition compared to global sources" and "that regional and local controls on atmospheric emissions have been effective in decreasing the delivery of Hg to lakes."

[2] Exhibit 7, Appendix to Comments of Environmental, Public Health, and Civil Rights Organizations on the Proposed National Emissions Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review, 84 Fed. Reg. 2670 (Feb. 7, 2019) (Apr. 17, 2019) (hereinafter "Comments of Environmental, Public Health, and Civil Rights Organizations"), Doc. ID No. EPA–HQ–OAR–2018–0794–1267.

[3] Exhibit 8, Appendix to Comments of Environmental, Public Health, and Civil Rights Organizations, Doc. ID No. EPA–HQ–OAR–2018–0794–1267.

David C. Depew et al., *Toxicity of Dietary Methylmercury to Fish: Derivation of Ecologically Meaningful Threshold Concentrations*, 31(7) Envtl. Toxicology & Chemistry 1536 (2012), https://deepblue.lib.umich.edu/bitstream/handle/2027.42/92130/1859_ftp.pdf?sequence=2&isAllowed=y.

Finding adverse effects on the reproductive and behavioral health of wild fish populations at low levels of environmental methylmercury exposure.

David C. Depew et al., *Derivation of Screening Benchmarks for Dietary Methylmercury Exposure for the Common Loon (*Gavia Immer*): Rationale for Use in Ecological Risk Assessment*, 31(10) Envtl. Toxicology & Chemistry 2399 (2012), https://deepblue.lib.umich.edu/bitstream/handle/2027.42/93756/1971_ftp.pdf?sequence=1&isAllowed=y.

Surveying literature and summarizing effects of dietary methylmercury on the common loon.

Human Health and Welfare Benefits

David G. Streets et al., *Global and Regional Trends in Mercury Emissions and Concentrations, 2010-2015*, 201 Atmospheric Env't 417 (2019), http://bgc.seas.harvard.edu/assets/ae-paper.pdf.

Analyzing global and regional trends in mercury concentrations in the period 2010 to 2015. Finding that U.S. emissions declined during this period.

Vivian E. Thomson, Kelsey Huelsman, & Dominique Ong, *Coal-fired power plant regulatory rollback in the United States: Implications for local and regional public health*, 123 Energy Pol'y 558 (2018), https://www.sciencedirect.com/science/article/pii/S030142151830627X.

Analyzing which U.S. regions benefited from air quality improvements due to the MATS Rule and transport rule by modeling estimated differences between the impacts of pre-regulatory emissions and current emissions on fine particulate matter ($PM_{2.5}$) concentrations and on public health. Finding that annual average $PM_{2.5}$ concentrations are lower by 1–5 µg/m3, and 17,176–39,291 premature mortalities are avoided for each year of lower emissions.

Xue Feng Hu, Kavita Singh, & Hing Man Chan, *Mercury Exposure, Blood Pressure, and Hypertension: A Systematic Review and Dose-Response Meta-analysis*, 126(7) Envtl. Health Perspectives 076002 (2018), https://ehp.niehs.nih.gov/doi/10.1289/EHP2863.

Reviewing 29 studies, covering more than 55,000 participants from 17 countries, and finding a significant positive association between mercury and hypertension and between mercury and blood pressure. Noting that "MeHg is generally considered to be the most toxic form [of mercury] and a dose-response relationship has been proposed between MeHg and cardiovascular outcomes."

Noah Kittner et al., *Trace Metal Content of Coal Exacerbates Air-Pollution-Related Health Risks: The Case of Lignite Coal in Kosovo*, 52(4) Environ. Sci. & Technol. 2359 (2018), https://pubmed.ncbi.nlm.nih.gov/29301089/.

Finding significant trace metal content in lignite coal from Obilic, Kosovo.

Giuseppe Genchi et al., *Mercury Exposure and Heart Diseases*, 14(1) Int'l J. Envtl. Research & Pub. Health 1 (2017), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5295325/pdf/ijerph-14-00074.pdf.[4]

Finding that high levels of methylmercury exposure in adults have been associated with adverse cardiovascular effects, including increased risk of fatal heart attacks.

Philippe Grandjean & Martine Bellanger, *Calculation of the disease burden associated with environmental chemical exposures: application of toxicological information in health economic estimation*, 16(123) Envtl. Health 1 (2017), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5715994/pdf/12940_2017_Article_340.pdf.[5]

Estimating the societal costs of the cognitive deficits associated with methylmercury exposure in the United States amount to approximately $4.8 billion annually.

Ki-Hyun Kim et al., *A Review on the Distribution of Hg in the Environment and Its Human Health Impacts*, J. Hazardous Materials 306 (2016), https://www.ncbi.nlm.nih.gov/pubmed/26826963.

Reviewing the route of mercury exposure to humans, its health impacts, and the associated risk assessment based on recent studies.

Vincent Nedellec & Ari Rabl, *Costs of Health Damage from Atmospheric Emissions of Toxic Metals: Part 2—Analysis for Mercury and Lead*, Risk Analysis 1 (2016), https://pubmed.ncbi.nlm.nih.gov/26992113/.

Estimating the damage cost associated with one kilogram of emitted mercury pollution, with 91% of the cost due to mortality from heart disease and the rest from IQ loss.

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[4] Exhibit 16, Appendix to Comments of Environmental, Public Health, and Civil Rights Organizations, Doc. ID No. EPA–HQ–OAR–2018–0794–1267.

[5] Exhibit 3, Appendix to Comments of Environmental, Public Health, and Civil Rights Organizations, Doc. ID No. EPA–HQ–OAR–2018–0794–1267.

Elsie M. Sunderland et al., *Benefits of Regulating Hazardous Air Pollutants from Coal and Oil-Fired Utilities in the United States*, 50 Envtl. Sci. & Tech. 2117 (2016), https://pubs.acs.org/doi/pdf/10.1021/acs.est.6b00239.

Concluding that the monetized benefits in EPA's 2011 Regulatory Impact Analysis for the MATS Rule underestimated power plants' contribution to local mercury deposition as well as the benefits associated with reductions of power-plant emissions. Concluding also that "as-yet-unquantified benefits to human health and wildlife from reductions in EGU mercury emissions are substantial."

Amanda Giang & Noelle E. Selin, *Benefits of mercury controls for the United States*, 113(2) Proceedings of the Nat'l Acad. of Sci. 286 (2016), https://www.pnas.org/content/pnas/113/2/286.full.pdf.[6]

Projecting that the total economy-wide benefits associated with the continued implementation of the MATS Rule through 2050 would amount to at least $43 billion based on reductions in mercury emissions alone. Providing a dose-response function quantifying the effect of methylmercury exposure on heart attacks.

Yanxu Zhang et al., *Observed Decrease in Atmospheric Mercury Explained by Global Decline in Anthropogenic Emissions*, 113(3) Proceedings of the Nat'l Acad. of Sci. 526 (2016), https://www.pnas.org/content/113/3/526.

Showing that spatial and temporal trends in atmospheric mercury concentrations and deposition are influenced by local and regional actions. "This implies that prior policy assessments underestimated the regional benefits of declines in mercury emissions from coal-fired utilities."

Aisha S. Dickerson et al., *Autism Spectrum Disorder Prevalence and Associations with Air Concentrations of Lead, Mercury, and Arsenic*, 188(7) Envtl. Monitoring & Assessment 407 (2016), https://www.ncbi.nlm.nih.gov/pubmed/27301968.

Examining associations between autism spectrum disorder prevalence and ambient concentrations of arsenic, lead, and mercury, and finding that tracts in the highest quartile of lead and mercury air concentrations had significantly higher autism prevalence than tracts in the lowest quartile for each of these pollutants, once the researchers adjusted for confounding factors.

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[6] Exhibit 2, Appendix to Comments of Environmental, Public Health, and Civil Rights Organizations, Doc. ID No. EPA–HQ–OAR–2018–0794–1267.

T.I. Fortoul et al., "Health Effects of Metals in Particulate Matter," in *Current Air Quality Issues* (Farhad Nejadkoorki ed. 2015), https://www.intechopen.com/chapters/48145.

Describing the health impacts, and mechanisms underlying the health impacts, of toxic metals in particulate matter.

Ahmed Zaky et al., *Chlorine Inhalation-induced Myocardial Depression and Failure*, 3(6) Physiol. Rep. 1 (2015), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4510636/.

Observing cardiac pathology in rats exposed to chlorine gas.

Sara T.C. Orenstein et al., *Prenatal Organochlorine and Methylmercury Exposure and Memory and Learning in School-Age Children in Communities Near the New Bedford Harbor Superfund Site, Massachusetts*, 122(11) Envtl. Health Perspectives 1253 (2014), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4216164/.

Finding that increases in maternal hair concentrations of mercury were associated with decreases in childhood memory and learning, particularly visual memory.

Lisa M. Sweeney et al., Naval Medical Research Unit Dayton, *Acute Lethality of Inhaled Hydrogen Cyanide in the Laboratory Rat: Impact of Concentration x Time Profile and Evaluation of the Predictivity of "Toxic Load" Models*, Rep. No. NAMRU-D-13-35 (2013), https://apps.dtic.mil/sti/pdfs/ADA579551.pdf.

Reporting acute effects of exposure to hydrogen cyanide in animals.

K. He et al., *Mercury Exposure in Young Adulthood and Incidence of Diabetes Later in Life: The CARDIA Trace Element Study*, 36(6) Diabetes Care 1584 (2013), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3661833/pdf/1584.pdf.

Finding that toenail mercury levels are associated with incidence of diabetes in a dose-response manner among American young adults.

Martine Bellanger et al., *Economic Benefits of Methylmercury Exposure Control in Europe: Monetary Value of Neurotoxicity Prevention*, 12(3) Envtl. Health 1 (2013), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3599906/.

Documenting neurodevelopmental impacts of methylmercury at exposure levels below EPA's reference dose.

Sofia Jonasson, Bo Koch, & Anders Bucht, *Inhalation of Chlorine Causes Long-standing Lung Inflammation and Airway Hyperresponsiveness in a Murine Model of Chemical-Induced Lung Injury*, 303 Toxicology 34 (2013), https://pubmed.ncbi.nlm.nih.gov/23146759/.

Exposing mice to chlorine one time and finding an acute response that subsided after 48 hours and a sustained airway hyperresponsiveness for at least 28 days.

Philippe Grandjean et al., *Calculation of Mercury's Effects on Neurodevelopment*, 120(12) Envtl. Health Persp. A452 (2012), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3548290/pdf/ehp.1206033.pdf.

Suggesting an updated dose-response relationship for prenatal methylmercury, with a lower threshold Hg level corresponding to 50% of the previous reference dose.

Compliance Costs

James E. Staudt, *Andover Technology Partners, Update of the Cost of Compliance with MATS – Ongoing Cost of Controls* 7, 8 tbl.8 (2019), Doc. ID No. EPA–HQ–OAR–2018–0794–1175 Att. 3.

Finding that annual incremental operating costs associated with the MATS Rule are approximately $203 million.

Declaration of James E. Staudt, attached to Comments of Calpine Corp. et al. on EPA's Proposed Supplemental Finding (Dec. 1, 2015), Doc. ID No. EPA–HQ–OAR–2009–0234–20549.

Finding that EPA's projection of compliance costs in 2015, $9.6 billion, was nearly five times higher than the actual estimated cost of approximately $2 billion incurred through 2016.

* * * *

Please do not hesitate to reach out to us should you have any questions about this information or like to discuss further. Our contact information is below. Thank you again for your time and consideration.

Respectfully Submitted,

FOR THE COMMONWEALTH OF MASSACHUSETTS

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ORAL ARGUMENT NOT YET SCHEDULED

**IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

State of North Dakota, et al., Petitioners, **v.** **United States Environmental Protection Agency,** Respondent.	Case No. 24-1119 (and consolidated cases)

On Petition for Review of Final Action of the United States Environmental Protection Agency

I, Hassan M. Bouchareb, state and declare as follows:

I. Purpose of this Declaration

1. I am an Engineer for the Minnesota Pollution Control Agency ("MPCA"). MPCA is the state agency responsible for monitoring environmental quality, providing technical and financial assistance, and enforcing environmental regulations.

2. I provide this declaration on behalf of the State of Minnesota and MPCA in support of the State and Local Government movants' motion to intervene in support of the Environmental Protection Agency's

("EPA's") final rule titled National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review ("Final Rule"). 89 Fed. Reg. 38,508 (May 7, 2024).

3. The Final Rule finalizes EPA's amendments to the national emission standards for hazardous air pollutants (NESHAP) for the Coal- and Oil-Fired Electric Utility Steam Generating Units (EGUs) source category.

4. The Final Rule is the result of EPA's review of its prior 2020 Residual Risk and Technology Review ("2020 RTR"). 85 Fed. Reg. 31,286 (May 22, 2020). The changes include the filterable particulate matter (fPM) surrogate emission standard for non-mercury metal hazardous air pollutants (HAP) for existing coal-fired EGUs, the fPM emission standard compliance demonstration requirements, and the mercury (Hg) emission standard for lignite-fired EGUs.

II. Experience and Qualifications

5. My responsibilities at MPCA include leading agency air quality rulemaking efforts and providing technical analysis for rulemaking, coordinating mercury reduction activities and technical analyses,

providing engineering technical leadership and expertise to air program staff and leadership, tracking regional and federal actions (including, specifically, coordinating comments and review on NESHAP revisions), and providing information to other MPCA staff, agency stakeholders, and the general public about NESHAP regulations.

6. I have more than 12 years of experience in the fields of air quality environmental regulation and 7 years of experience coordinating statewide mercury reduction efforts across the state of Minnesota, including evaluating the capabilities of emission reduction technologies and strategies for reducing mercury emissions from a variety of sources. I am familiar with sources of mercury, such as coal- and oil-fired power plants, the transport and deposition of mercury, and the impacts of mercury on environment and human health.

7. I received a B.S. in Chemical Engineering in 2011 from the University of Minnesota - Twin Cities. I served on the 2021 Ad Hoc Committee on Mercury Contamination that was charged to develop a policy resolution for the Great Lakes Commission (GLC) focusing on mercury monitoring, research and reduction, legislative priorities, and other needs in the Great Lakes-St. Lawrence River basin. I have served on

the board of directors for the Air and Waste Management Association-Upper Midwest Section (AWMA-UMS) beginning in 2022. I have presented annually since 2016 on air quality regulatory updates at the Conference on the Environment hosted in Minneapolis, MN, by AWMA-UMS and Central States Water Environment Association (CSWEA). I was invited and presented as a keynote speaker at the National Association of Environmental Professionals 2024 annual conference and training symposium.

8. I have been the co-author on 12 MPCA reports on mercury and have been responsible for coordinating implementation of Minnesota's Statewide Mercury Total Maximum Daily Load ("Mercury TMDL") pursuant to the federal Clean Water Act.[1]

III. Minnesota is Adversely Impacted by Anthropogenic Mercury Deposition from Regional and Global Sources.

9. Minnesota is known as "The Land of 10,000 Lakes." Fishing is an important cultural, recreational, and economic resource to the state and is a hallmark component of several tribal treaty rights. Self-caught fish are

[1] *See* 33 U.S.C. § 1313(d)(1) (requiring development of TMDLs for impaired waters).

a major component of many Minnesotans' diets—from Indian country to the Twin Cities Metro area—especially Minnesotans in environmental justice communities.

10. Mercury is a well-known neurotoxin, especially to developing nervous systems, and fish consumption is the primary source of mercury to humans and wildlife. Minnesota has an astonishing 1,696 mercury-impaired waterbodies due to mercury in fish tissue or sediment.[2] And fish consumption advisories are in place for hundreds of lakes and rivers, advising Minnesotans not to consume fish because of unhealthy levels of mercury toxicity.[3]

11. Minnesota's EPA-approved Mercury TMDL sets a mercury budget that is intended to reduce mercury contamination in Minnesota's waters to levels that will allow for the lifting of fish consumption

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[2] MPCA, *2024 Impaired Waters List* (Apr. 1, 2024), https://www.pca.state.mn.us/sites/default/files/wq-iw1-81.xlsx.

[3] *See* Minn. Dep't Pub. Health, *2024 Fish Consumption Guidelines for Pregnant Women, Women Who Could Become Pregnant, and Children under Age 15 – Lakes* (Mar. 2024), https://www.health.state.mn.us/communities/environment/fish/docs/eating/specpoprivers.pdf; Minn. Dep't Pub. Health, *2023 Fish Consumption Guidelines for Pregnant Women, Women Who Could Become Pregnant, and Children under Age 15 – Lakes* (July 2023), https://www.health.state.mn.us/communities/environment/fish/docs/eating/specpoplakes.pdf.

advisories. Minnesota regularly revises the list of impacted waters covered by its original 2007 Mercury TMDL based on MPCA's development of fish tissue concentration data and mercury water column data developed in accordance with Minnesota' water quality monitoring strategy. *See* 33 U.S.C. § 1313(d)(1) (requiring development of TMDLs for impaired waters). Minnesota also regularly revises the list of mercury-emitting facilities which are covered by the TMDL. Both types of revision are subject to regulatory processes and must be approved by EPA. (Such revisions do not make any changes to the original TMDL targets, reduction factors, loading capacities, allocations, reduction goals or other equation elements.) On March 5, 2024, EPA issued its approval of Minnesota's 2024 Revisions to the Minnesota TMDL.[4]

12. Minnesota has been monitoring mercury in fish since 1970. Mercury concentrations in lakes and rivers throughout the state have declined since 1970 but remain high. There actually has been an upward

[4] EPA, *Minnesota TMDL Approval Letter* (March 5, 2024), https://www.pca.state.mn.us/sites/default/files/wq-iw4-01ah.pdf.

trend of mercury in fish since 1990.[5] Northern Minnesota is dominated by forests, wetlands, and lakes, yet mercury levels in sport fish are higher than in other parts of the state. Essentially all the mercury entering Minnesota's waterbodies is from atmospheric deposition. Less than one percent is from point source discharges to surface waters, and there are no geologic sources.

13. Several recent studies have demonstrated the decrease of mercury levels in fish following decreased regional mercury emissions. For example, a large collaborative investigation of mercury in the Great Lakes region showed generally downward mercury trends in Northern Pike and Largemouth Bass that corresponded to the decline in regional mercury emissions and mercury deposition to lakes.[6]

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[5] Monson, B.A., *Trend reversal of mercury concentrations in piscivorous fish from Minnesota Lakes: 1982−2006*, 43(6) Environmental Science & Technology 1750-55 (2009).

[6] Evers, D.C., Wiener, J.G., Driscoll, C.T., Gay, D.A., Basu, N., Monson, B.A., Lambert, K.F., Morrison, H.A., Morgan, J.T., Williams, K.A. and Soehl, A.G., *Great Lakes mercury connections: the extent and effects of mercury pollution in the Great Lakes region* (2011); Evers, D.C., Wiener, J.G., Basu, N., Bodaly, R.A., Morrison, H.A., Williams, K.A., *Mercury in the Great Lakes region: bioaccumulation, spatiotemporal patterns, ecological risks, and policy*, 20(7) Ecotoxicology 1487-99 (2011); Drevnick, P.E., Engstrom, D.R., Driscoll, C.T., et al., *Spatial and temporal patterns of mercury accumulation in lacustrine*

14. According to MPCA estimates in the original 2007 Mercury TMDL, approximately 90% of the mercury deposition in Minnesota comes from outside the state, both from global and regional sources.[7] Anthropogenic mercury deposition originating from regional sources was estimated to account for about 30% of Minnesota's mercury deposition, while in-state contributions were estimated to make up 10% of the load.[8] The exact contribution from various regional, out-of-state sources remains a topic of current research, but because Minnesota receives mercury pollution from outside the state, as well as from in-state sources, addressing mercury impairments in waterbodies requires reducing pollution from both in-state and out-of-state sources.

15. Ambient air mercury concentrations across the United States have fallen due to federal and state regulatory actions and market forces, even as emission inventories show global increases in mercury emissions,

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sediments across the Laurentian Great Lakes region, 161 Env't Pollut. 252-60 (2012); Monson, B.A., Staples, D.F., Bhavsar, S.P., Holsen, T.M., Schrank, C.S., Moses, S.K., McGoldrick, D.J., Backus, S.M. and Williams, K.A., *Spatiotemporal trends of mercury in walleye and largemouth bass from the Laurentian Great Lakes region*, 20(7) Ecotoxicology 1555-67 (2011).

[7] MPCA, *Minnesota Statewide Mercury Total Maximum Daily Load* 20-22 (2007), www.pca.state.mn.us/sites/default/files/wq-iw4-01b.pdf.

[8] *Id.*

indicating that local and regional mercury reductions continue to be important. Because local fish mercury concentrations remain unacceptably high in Minnesota, and across the United States, more reductions are needed locally and regionally to reduce those levels for the long term.

16. Domestic coal-fired power plants have long been a significant contributor to mercury contamination in the United States, including the Great Lakes region. The latest United Nations global mercury assessment,[9] published in 2018, reports the emissions of mercury to air from specific sectors within countries for 2015; in the United States, power plant combustion of coal represented 53% of the total domestic mercury emissions.[10]

[9] U.N. Env't Program, *Global Mercury Assessment* (2018), https://www.unep.org/topics/chemicals-and-pollution-action/pollution-and-health/heavy-metals/mercury/global-mercury-2.

[10] U.N. Env't Program, *Technical Background Report to the Global Mercury Assessment* at 3-17, Tbl. 3-5 (2018) (projecting 19,145 kg in mercury emissions from U.S. coal-fired power plants and 36,332 kg in total U.S. anthropogenic mercury emissions in 2015), https://wedocs.unep.org/bitstream/handle/20.500.11822/29831/gma_tech.pdf?sequence=1&isAllowed=y.

17. As described in the Great Lakes Binational Strategy for Mercury Risk Management ("Binational Strategy"),[11] mercury emitted from anthropogenic sources may remain in the atmosphere for six months to a year, enabling long-range global transport prior to eventual atmospheric deposition. Atmospherically deposited mercury accumulates on trees, soil, water, or other surfaces. In addition to long-range transport and deposition, mercury also deposits locally. Gaseous oxidized and particulate mercury forms generally deposit much more rapidly than elemental mercury and have a much shorter atmospheric residence time. Although those oxidized forms of mercury make up a small fraction of total atmospheric mercury, they can be a large part of total mercury deposition.

18. The Binational Strategy specifically reports that observed reductions in mercury contamination in North America in recent years reflect the phase-out of mercury from commercial products as well as mercury emissions reductions as a co-benefit from sulfur dioxide (SO_2) and

[11] Env't & Climate Change Canada and EPA, *Great Lakes Binational Strategy for Mercury Risk Management* 3 (June 2021), https://binational.net/wp-content/uploads/2021/06/20210615-Mercury-Strategy-FINAL.pdf.

nitrogen oxides (NOx) emission controls on coal-fired utilities.[12] But there is still more work to do in Minnesota and the Great Lakes region.

IV. Minnesota has Long Worked to Reduce Mercury Deposition within its Borders.

19. In an effort to combat this widespread mercury contamination within the state, Minnesota has developed an EPA-approved implementation plan for its Mercury TMDL.

20. Minnesota's implementation of the Mercury TMDL has been focused primarily on reducing all in-state mercury emissions by 93% from 1990 levels. However, the TMDL emphasizes that we also need national and international mercury reductions to meet our state's water quality standard for mercury.

21. The original 2007 Mercury TMDL established a load allocation for the primary nonpoint mercury source, atmospheric deposition. MPCA assigned wasteload allocations to point sources, including electricity generators, wastewater treatment facilities, and industrial discharges (*e.g.*, pulp and paper mills, taconite processing facilities and refineries). The work of the Mercury TMDL remains underway as MPCA continues to

[12] *Id.*

pursue the reductions necessary to meet the water quality standards for mercury.

22. Minnesota is a member of The Great Lakes Commission, which recently published a unanimous resolution by an Ad Hoc Committee on Mercury Contamination.[13] That resolution summarizes extensive mercury-reduction efforts in Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin. Among other things, the resolution supports efforts in the United States and Canada to authorize and fund mercury-monitoring efforts, supports research to better understand and target mercury reductions and remediation, and encourages continued pursuit of mercury reduction and remediation.

23. Minnesota agencies, including MPCA, the Department of Health, and the Department of Natural Resources expend time, taxpayer dollars, and other resources monitoring, assessing, and responding to mercury levels in state waters.

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[13] Great Lakes Commission Resolution, *Mercury Monitoring, Research, and Risk Reduction Efforts in the Great Lakes Basin* (Oct. 14, 2021) (unanimous), https://www.glc.org/wp-content/uploads/FINAL-GLC-Resolution-Mercury-20211014.pdf.

24. In 2006, Minnesota passed the Mercury Emissions Reduction Act (MERA), which set a schedule for the largest coal-fired utility boilers in the state to reduce mercury emissions by 90% from 2005 levels.[14] As of 2015, all Minnesota utilities have achieved full compliance with MERA. To achieve these reductions, utilities retrofitted some coal-fired plants with improved pollution controls, switched some to natural gas, and shut down others. The changes these facilities made to reduce mercury emissions also brought 75-80% reductions in emissions of air pollutants such as NO_X, SO_2, and $PM_{2.5}$, as well as significant reductions in greenhouse gases.

25. Minnesota also has a substantial taconite ore industry that contributes to the state's mercury contamination, and Minnesota has long advocated for control of mercury emissions from that industry through development of a NESHAP and Risk and Technology Review under Clean Air Act section 112. Despite the Clean Air Act's requirement that EPA set a limit for mercury emissions from the taconite ore industry by 2000, EPA did not set one until 2024.[15] That decades-long delay in federal regulation

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[14] Minn. Stat. §§ 216B.02-216B.688.

[15] *National Emission Standards for Hazardous Air Pollutants: Taconite Iron Ore Processing*, 89 Fed. Reg. 16,408 (March 6, 2024).

of mercury emissions from taconite ore processing contributed to Minnesota's cumulative mercury load. Further, because EPA's recent taconite processing standards for mercury emissions face legal challenges, ensuring reductions in regional mercury deposition from power plant emissions is especially important for reducing mercury contamination in Minnesota.

26. MPCA's efforts to address mercury contamination within its borders have necessarily focused on Minnesota's own contribution to regional, national, and global mercury air pollution. But, as discussed next, the Final Rule is significant as it provides for federal emissions standards that will improve mercury emissions from lignite-fired plants just over our border in North Dakota.

V. Minnesota Faces a Significant Risk of Regional Mercury Deposition from Emissions of Upwind Lignite-Fired Power Plants.

27. As the Final Rule describes, mercury pollution emitted by EGUs is one of the largest domestic sources of mercury—and it can be

controlled by readily available and cost-effective control technologies such as activated carbon injection (ACI).[16]

28. But such controls were not required for lignite-fired EGUs, which now compose 16 of the top 20 mercury-emitting units.[17] As of 2021, lignite-fired EGUs were responsible for almost 30% of all mercury emitted from coal-fired EGUs, while generating only about 7% of total 2021 megawatt-hours. Lignite accounted for 8% of total U.S. coal production in 2021.[18] But by the same token, EPA concluded that there are available cost-effective control technologies and improved methods of operation that

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[16] 89 Fed. Reg. at 38,517-518; *see also* EPA, *2023 Technology Review for the Coal- and Oil-Fired EGU Source Category* (''2023 Technical Memo''), (Document ID No. EPA–HQ–OAR– 2018–0794–5789).

[17] 89 Fed. Reg. at 38,537.

[18] *Id*.

would ensure that even lignite-fired units can achieve more stringent mercury emissions standards.[19]

29. Specifically, EPA expects that lignite-fired units could meet a 1.2 lb/TBtu standard by using brominated activated carbon at certain injection rates.[20] This represents a 90% mercury control.[21]

30. Absent the Final Rule, and absent any applicable state requirements for implementing mercury controls, units that fire lignite coal will continue to emit mercury at very high levels.

31. There are approximately 22 units that are permitted as lignite-fired EGUs in the entire country, and 7 of them are located in North Dakota. North Dakota does not have any state requirements for its lignite-fired EGUs to meet the 1.2 lb/TBtu emission standard that the Final Rule provides, and I am not aware of any other plan for these seven lignite-fired

[19] *Id.*
[20] 89 Fed. Reg. at 38,547.
[21] *Id.*

plants in North Dakota to achieve a 90% mercury control level without the Final Rule's requirements.

32. As detailed above, Minnesota and the Great Lakes region suffer from regional deposition of anthropogenic mercury emissions and Minnesota has gone to great lengths to control and address mercury deposits within its own borders. Minnesota shares its western border with North Dakota and is situated downwind from North Dakota according to the prevailing polar jet stream, which flows over the area from west to east.[22] The jet stream continues west to east throughout the rest of the Great Lakes region.[23]

33. A reduction in the mercury emissions from the 7 lignite-fired EGUs in North Dakota will directly benefit Minnesota by reducing regional anthropogenic mercury deposition and will support Minnesota's own efforts to address mercury contamination, including its TMDL and implementation plan, within its own borders. It will also benefit

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[22] National Oceanic and Atmospheric Administration, *The Jet Stream*, https://www.noaa.gov/jetstream/global/jet-stream.
[23] *Id*.

Minnesota's efforts as part of the Great Lakes Commission to address mercury deposition in the Great Lakes region.

I declare that to the best of my knowledge, under the penalty of perjury under the laws of the United States, that the foregoing is true and correct.

Executed on June 6, 2024, in Dakota County, Minnesota.

Hassan Bouchareb

DECLARATION OF ROBERT BYRON, MD, MPH

I, Dr. Robert Byron, hereby declare as follows:

Purpose of this Declaration

1. I am aware that EPA—through the Mercury and Air Toxics Standards ("MATS")—set standards to reduce toxic pollution from coal-fired power plants. I also understand that EPA has recently updated those standards in a new Technology Review ("MATS Update Rule") for coal-fired power plants. As a result of that review EPA has, among other things, set lower standards for filterable particulate matter, as a surrogate for toxic metals, emitted by the Colstrip power plant and other coal-fired power plants.
2. I provide this declaration to describe the adverse health impacts associated with a stay of the MATS Update Rule, which could delay Colstrip's compliance with the rule. Any delay in compliance with the MATS Update Rule would subject the residents of the town of Colstrip (where the Colstrip power plant is located) and the surrounding area to unnecessary health risks. Timely implementation of the rule would deliver substantial public health benefits to residents of Colstrip and the surrounding area.

Experience and Qualifications

3. Prior to my retirement in 2022, I was a physician for about 34 years, serving the community of southeastern Montana. I obtained a Doctor of Medicine degree in 1984 and was board certified in Internal Medicine in 1987. I obtained a Masters in Public Health from the University of Washington in 1998.

4. I practiced internal medicine on the Crow Indian Reservation for over two decades. My practice included seeing patients in a clinical setting, caring for patients in the emergency room, and working with patients admitted to the hospital.

5. After my time on the Crow Indian Reservation, I helped found the Bighorn Valley Health Center—now called One Health—to improve access to healthcare in Hardin, Montana. I also worked as a hospitalist at Intermountain Health St. Vincent Regional Hospital. During this time, I provided primary care, emergency care and public health services to patients.

6. During my time as a physician I treated patients presenting with a variety of symptoms, across a variety of age groups. I have treated patients with cardiovascular or respiratory conditions, such as asthma and heart disease.

7. When I first started practicing medicine in the 1980s, doctors would advise patients in higher risk categories to avoid going outside during extreme heat events. However, as time went on, the literature on cardiovascular and respiratory health was growing and becoming more robust. There were studies done on the interaction of heat, smoke, and chronic illness which showed that exposure to poor air quality, especially during heat events, can exacerbate the health conditions people experience. In accordance with this medical research, I would advise patients with respiratory and cardiovascular conditions to avoid the outdoors during smoke or heat events to minimize the risk of flare ups.
8. Over the past decade, I have made presentations on climate change and health locally, nationally, and internationally, and I was one of the lead authors of the 2021 report, *Climate Change and Human Health in Montana: A Special Report of the Montana Climate Assessment*, published by Montana State University. The report discusses climate impacts in Montana and explains, among other things, that particulate matter exposure has a number of adverse health effects, including premature death.
9. I am competent to testify about the adverse health impacts of air pollution, as well as the state of public health in southeastern Montana. I offer my opinions based on my professional experience practicing medicine in

southeastern Montana, my public health expertise, and my evaluation of research on the public health impacts of the Colstrip power plant on the surrounding area.

Air pollution emitted by coal-fired power plants is associated with adverse health effects.

10. Air pollution from coal combustion is devastating to public health. Coal plant emissions have been associated with aggravation of heart and lung disease and can lead to increased heart attacks, strokes, asthma attacks and heightened susceptibility to respiratory infections, resulting in more frequent clinic and emergency department visits, hospitalizations and premature death. EPA, Human Health & Environmental Impacts of the Electric Power Sector**,** https://www.epa.gov/power-sector/human-health-environmental-impacts-electric-power-sector.

11. Studies of coal-fired power plants have demonstrated that, after the power plants closed, asthma-related events decreased (Casey et al., 2020; Komisarow and Pakhtigian, 2021), and pre-term births decreased (Casey et al., 2018).

12. In a peer-reviewed article published in *Science* in 2023, *Mortality Risk from United States Coal Electricity Generation*, Henneman et al. attributed 460,000 deaths in the U.S. from 1999 to 2020 to particulate matter (PM) pollution from coal plants.

Colstrip operates without proper pollution controls and contributes to elevated particulate matter pollution.

13. I am aware that the Colstrip power plant is the only facility in the country that does not use industry standard technology for controlling filterable particulate matter pollution. As a result, the plant contributes to elevated levels of particulate matter in Colstrip, Montana, and the surrounding Rosebud County.

14. I am aware that Colstrip's emissions of non-mercury metal air pollution—measured as filterable particulate matter—are two to three times the new limit EPA adopted in the MATS Update Rule. Colstrip Units 3 and 4 are the first and third highest emitters of such pollution in the country.

15. An Environmental Impact Statement (EIS), conducted by the U.S. Office of Surface Mining, found that Rosebud County "has one of the highest concentrations" of fine particulate matter in Montana along with elevated incidence of asthma and lung cancer. Montana Department of Environmental Quality, *Final Environmental Impact Statement* (November 2018) at 178. The EIS acknowledged that these "relatively high rates of chronic disease . . . may be linked . . . to environmental pollution from coal plant emissions." *Id.* at 184.

16. The American Lung Association in its 2023 State of the Air report for the United States assigned Rosebud County, Montana an "F"—a failing grade—

for high particulate matter pollution. American Lung Association, State of the Air, 2023 Report at 106, https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf.

17. Lame Deer on the Northern Cheyenne Reservation in Rosebud County is especially burdened by fine particulate matter pollution. It has been listed as a non-attainment area for large particulate matter (PM 10) pollution for the past 30 years, meaning levels of particulate matter in the air exceed federal limits designed to protect public health.

Colstrip emissions harm public health.

18. I am aware that the Colstrip power plant emits particulate matter, mercury, sulfur dioxide, nitrogen oxides, toxic metals and a host of other pollutants that are linked to adverse health impacts. These emissions increase the risk of mortality and other adverse health effects in Colstrip, Montana, and the surrounding area.

19. Henneman et al. created an online data exploration tool—the Coal Pollution Impacts Explorer, or CPIE—available online at https://cpieatgt.github.io/cpie/, that displays mortalities associated with fine particulate matter (PM 2.5) from individual coal plants, including the Colstrip power plant. The article concludes that fine particulate matter pollution from the Colstrip power plant has caused 380 deaths nationwide

from 1999 to 2020 (with upper and lower confidence intervals of 340 and 410).

20. In addition, estimates by the Clean Air Task Force attribute 48 premature deaths per year to the Colstrip power plant prior to the closure of Units 1 and 2. Clean Air Task Force, Toll from Coal, https://www.tollfromcoal.org/#/map/(title:6076//detail:6076//map:6076/MT. The Clean Air Task Force also attributed 5 hospital admissions, 10 asthma-related ER visits, 20 heart attacks, 540 asthma attacks, and about 2,500 lost workdays per year to the plant.

21. Clean Air Task Force developed the figures cited in the above paragraph using the CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool developed by Abt Associates, a public health benefits consultant for U.S. EPA.

22. In addition to mortality, air pollution, especially particulate matter, from coal combustion causes cardiovascular and respiratory problems. When particulate matter enters the body, it can cause inflammation in, among other areas, the lining of the blood vessels and the lungs. Inflammation, in turn, increases the risk of multiple medical conditions including heart attacks, asthma attacks, and bronchitis. When the Colstrip power plant emits air pollution, it therefore increases the likelihood of these and related medical

conditions in individuals who live in the town of Colstrip and the surrounding area.

23. The most vulnerable groups, including children, pregnant individuals and their fetuses, and the elderly, are at higher risk to develop health complications as a result of exposure to the Colstrip power plant's emissions. Epidemiological studies on pregnant women suggests a relationship between air pollution exposure and poor birth outcomes such as preterm birth, low birth weight, miscarriage and preeclampsia. Children, whose lungs are still developing, may have impacted respiratory health from breathing in polluted air. For older adults, air pollution can increase the risk of heart attacks and may increase the risk of dementia.

Delaying implementation of the MATS Update Rule would harm public health in Colstrip and the surrounding area.

24. The data are clear and strong. The people who live in Colstrip, Montana, are living within extreme proximity to a massive source of toxic emissions—including toxic metals, a component of PM—which increases their risk of developing or worsening health complications down the line.

25. Timely installation of pollution controls at the Colstrip power plant would result in massive gains in the protection of public health for the residents of Colstrip as well as the surrounding and downwind areas. As a physician, I

believe that we should realize these health benefits and limit the amount of toxic air pollution people are exposed to.

26. Any delay in implementation of the MATS Update Rule would delay the realization of significant public health benefits. Residents of Colstrip and the surrounding area would continue to experience the adverse health effects described above, including—among other things—increased risk of premature death and medical conditions affecting the cardiovascular and respiratory systems.

I declare under penalty of perjury that the foregoing is true and correct. Executed this 18th day of July, 2024.

Robert G Byron

Robert Byron, MD, MPH

Citations:

Casey, J. A., Karasek, D., Ogburn, E. L., Goin, D. E., Dang, K., Braveman, P. A., & Morello-Frosch, R. (2018). Retirements of Coal and Oil Power Plants in California: Association With Reduced Preterm Birth Among Populations Nearby. American Journal of Epidemiology, 187(8), 1586–1594. https://doi.org/10.1093/AJE/KWY110

Casey, J. A., Su, J. G., Henneman, L. R. F., Zigler, C., Neophytou, A. M., Catalano, R., Gondalia, R., Chen, Y. T., Kaye, L., Moyer, S. S., Combs, V., Simrall, G., Smith, T., Sublett, J., & Barrett, M. A. (2020). Coal-fired power plant closures and retrofits reduce asthma morbidity in the local population. Nature Energy 2020 5:5, 5(5), 365–366. https://doi.org/10.1038/s41560-020-0622-9

Komisarow, S., & Pakhtigian, E. L. (2021). The Effect of Coal-Fired Power Plant Closures on Emergency Department Visits for Asthma-Related Conditions Among 0-to 4-Year-Old Children in Chicago. AJPH, 111(5). https://doi.org/10.2105/AJPH.2021.306155

I, Michael Goggin, hereby declare as follows:

1. I am over the age of 18 and I am Vice President at Grid Strategies, LLC, a consulting firm based in the Washington, D.C. area. Attached hereto as *Attachment 1* is my curriculum vitae.

2. *Attachment 2* is a report I prepared addressing claims made in this litigation by Montana Department of Environmental Quality Administrator Sonja Nowakowski, Vice President John Hines of NorthWestern Energy (NorthWestern), and others that the retirement of the Colstrip power plant, if it occurred, would pose a risk to electric reliability in Montana and the Northwest. The analyses and opinions represented in the attached report are my own. I hereby adopt my full report as if it were stated in my declaration in full.

3. Section I of my report demonstrates that NorthWestern, the Montana utility that co-owns Colstrip, currently enjoys a large surplus of generating capacity, and it could use new and existing resources in Montana and the broader region to replace Colstrip many times over. Using information NorthWestern Energy submitted to the Montana Public Service Commission, I demonstrate:

- Due to that surplus, very little of NorthWestern's 440 MW Colstrip share (as of 2026, after NorthWestern's planned acquisition of 220 MW from Colstrip co-owner Avista Utilities) is necessary to meet peak electricity demand from NorthWestern Energy customers, including both summer and winter peak demand.

- If Colstrip were to shut down in 2027, NorthWestern Energy could reliably meet peak demand simply by extending existing generation and capacity contracts, signing new capacity contracts, or bringing new Montana generating resources (including wind, solar, and battery storage) online. NorthWestern's claimed need for Colstrip is simply an artifact of it not yet contracting with enough resources to meet its needs on paper, and does not reflect a physical shortage of resources in the region.
- More than 12,400 MW of new generating resources have applied to interconnect to NorthWestern's power system. 6,700 MW of these are under construction or in the final stages of the approval process for connecting to NorthWestern's transmission system and have planned in-service dates before 2027. These resources provide 2,600 MW of dependable capacity towards meeting NorthWestern's summer peak demand and 2,150 MW towards winter peak. This is enough to meet any capacity need created by Colstrip's retirement 22 times over, indicating NorthWestern could replace Colstrip if it agrees to purchase the output of less than 5% of these projects. Projects in the final stages of the interconnection process can typically be brought

online quickly, as they have made substantial progress towards completing the steps that take the longest, like interconnection studies. Construction timelines for wind, solar, and battery storage plants are quite short, often less than a year, so resources could easily be brought online in time to replace Colstrip if it retired in three years.

4. Section II shows that Colstrip often fails to perform during periods of peak electricity demand, and that a portfolio of replacement resources can match or exceed Colstrip's contributions across a range of reliability services. Specifically:

- While Mr. Hines asserts Colstrip provides dependable "baseload" capacity, in reality the plant has had outages due to equipment failures and other reasons during both summer and winter peak demand periods in recent years. Mr. Hines and Ms. Nowakowski claim Colstrip played a key role in meeting demand during a January 2024 cold snap, but in reality the plant had low availability for critical periods of that event because one of two units at the plant was taken offline for emergency repairs. Analysis of Colstrip's performance during recent peak demand events shows that only around half of Colstrip's capacity is dependably available.

- Even setting aside Colstrip's poor performance, independent analyses demonstrate that resources such as storage, gas generators, hydropower, and portfolios of wind and solar resources, exceed coal plants' contributions to grid reliability services. These resources provide capacity value that is just as dependable, if not more dependable, than that provided by what were historically referred to as "baseload" resources, like coal-fired power plants.
- Many of the resources that have applied to connect to NorthWestern's transmission system will connect directly at Colstrip or along the Colstrip Transmission System, which would allow them to replace Colstrip in providing voltage and stability support and other local reliability services.

5. Section III of my report refutes NorthWestern's claims that transmission constraints would limit the utility's ability to import resources to replace Colstrip. Specifically:

- NorthWestern has relied on imports to reliably meet a large share of its energy and capacity needs for decades, and import transmission capacity has only increased and not decreased over time. Montana generation has also grown, freeing up transmission capacity for additional imports.

- My analysis demonstrates excess capacity along the primary transmission routes into Montana.
- Regardless, claims about transmission import capacity do not affect NorthWestern's ability to replace Colstrip with the large quantity of new Montana resources already in advanced stages of planning and/or construction.

6. In summary, as explained more fully in my report, available information refutes claims that the retirement of Colstrip, if it occurred, would pose a risk to electric reliability. NorthWestern could use the massive supply of existing and new generating resources in Montana and the broader Northwest region to replace Colstrip many times over by July 2027. This portfolio of replacement resources can match or exceed Colstrip's contributions across a range of reliability services, in part because Colstrip often fails to perform during periods of peak electricity demand.

7. I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 20, 2024.

Michael Goggin

ATTACHMENT 1

Michael Goggin

Education:

Harvard University class of 2004, B.A. *cum laude* in Social Studies

- Wrote thesis "Is it Time for a Change? Science, Policy, and Climate Change"

Experience:

Grid Strategies Vice President February 2018-present

- Serve as an expert consultant on electricity transmission, grid integration, reliability, market, and public policy issues for environmental and clean energy industry clients
- Have testified before FERC and in dozens of state regulatory commission cases
- Actively engaged in NERC Standards development processes related to renewable and storage resources

AWEA Senior Director of Research, other titles February 2008-February 2018

- Led team responsible for all American Wind Energy Association analysis
- Served as primary technical and economic expert on market design, transmission, grid integration, carbon policy, and other topics
- Authored regulatory filings at state (IRP and transmission siting cases), regional (RTO transmission and market design), and federal levels (FERC transmission, interconnection standard, grid integration, and market design cases; EPA carbon policy)
- Directed economic and power sector modeling to inform AWEA's policy strategy and support advocacy positions
- Communicated with the press and policy makers about wind energy
- Other titles included Electric Industry Analyst, Senior Analyst, Manager of Transmission Policy, Director of Research

Sentech, Inc. Research Analyst October 2005-February 2008

- Conducted economic analyses of solar, wind, geothermal, hydrogen, and energy storage technologies for U.S. Department of Energy officials
- Provided analytical support for DOE's renewable energy R&D funding decisions

Union of Concerned Scientists Clean Energy Intern May 2005-October 2005

- Worked with the legislative and field staff to promote the inclusion of pro-renewable energy measures in the Energy Policy Act of 2005

State Public Interest Research Groups Policy Analyst August 2004-May 2005

- Analyzed and advocated for clean energy policies at the state and federal level

Publications available at https://gridstrategiesllc.com/reports/

ATTACHMENT 2

Replacing Colstrip will Improve Electric Reliability

July 2024

Michael Goggin, Grid Strategies

Executive Summary

This report refutes claims made by Montana Department of Environmental Quality Administrator Sonja Nowakowski, Vice President John Hines of NorthWestern Energy (NorthWestern), and others that the retirement of the Colstrip power plant, if it occurred, would pose a risk to electric reliability in Montana and the Northwest. Section I demonstrates that NorthWestern, the Montana utility that co-owns Colstrip, currently enjoys a large surplus of generating capacity, and it can use new and existing resources in Montana and the broader region to replace Colstrip many times over.[1] Section II shows that Colstrip's actual contribution to meeting NorthWestern's and regional needs for dependable capacity is low because it routinely fails to perform during periods of peak electricity demand, and that a portfolio of replacement resources can match or exceed an aging coal plant in providing a range of reliability services. Section III explains how transmission constraints do not limit Montana's ability to import replacement resources.

I. NORTHWESTERN HAS A LARGE GENERATING CAPACITY SURPLUS, AND CAN REPLACE COLSTRIP

NorthWestern's own data, filed in Montana Public Service Commission Docket 2023.08.076 in August 2023, show it has a large generating capacity surplus extending into the 2030s.[2] NorthWestern's projections show capacity surpluses of at least 239 MW above its required reserve margin[3] in every year between 2027 and 2031, as indicated in the first row of the tables below showing the summer and winter capacity surplus. As a result, a large percentage of NorthWestern's approximately 440 MW share of Colstrip's capacity[4] is not needed to meet electricity demand, as calculated in the third row of the tables below, particularly after errors in

[1] Colstrip Units 3 and 4 are co-owned by Talen Montana, Puget Sound Energy Inc., Portland General Electric Company, Avista Corporation, PacifiCorp and NorthWestern Energy. Talen Montana, the plant's operator, is a merchant generator. NorthWestern Energy is the only utility owner with Montana customers.

[2] NorthWestern Energy, Montana Public Service Commission Docket 2023.08.076, Exhibit SIS-3, August 2023.

[3] As background, "capacity" is the contribution of a generating resource towards meeting peak demand needs, typically measured in MegaWatts (MW). Utilities typically have a "reserve margin" of generating capacity above their expected peak demand to ensure they can reliably meet demand even with risk factors like interannual variability in peak demand due to extreme weather, unexpected outages of generating resources, and other risks. The capacity surplus shown in Tables 1 and 2 is the surplus above that reserve margin, and therefore unnecessary excess capacity beyond what is needed for reliability.

[4] NorthWestern currently owns 222 MW in Colstrip and starting in 2026 will acquire an additional 222 MW.

NorthWestern's calculations are corrected in row two. Moreover, this report demonstrates that NorthWestern can readily meet any capacity need resulting from Colstrip's possible retirement many times over by signing contracts to purchase capacity from operating generators or by bringing new Montana generating resources online. In fact, simply extending existing contracts would meet any capacity need several times over if Colstrip retires, as indicated in the last row of the tables below. As explained below, NorthWestern has always relied on contracts to meet a large share of its capacity needs at low cost, and data indicate these contracts continue to be available. In short, NorthWestern's claimed need for Colstrip is simply an artifact of it not yet contracting with enough resources to meet its needs on paper, and does not reflect a physical shortage of resources in the region.

Table 1: NorthWestern capacity surplus (deficit) in MW, summer

	2027	2028	2029	2030	2031
1. Capacity surplus above reserve margin, from NorthWestern	346	307	255	253	250
2. +113 MW to correct battery/hybrid credit	459	469	417	414	411
3. Minus Colstrip	23	33	(19)	(22)	(25)
4. With extension of capacity contracts	233	343	291	288	285

Table 2: NorthWestern capacity surplus (deficit) in MW, winter

	2027	2028	2029	2030	2031
1. Capacity surplus above reserve margin, from NorthWestern	239	299	243	241	240
2. +108 MW to correct battery/hybrid credit	347	407	351	349	348
3. Minus Colstrip	(95)	(35)	(91)	(93)	(94)
4. With extension of capacity contracts	165	225	169	167	166

In the second row in the tables above, I correct several errors in NorthWestern's capacity projections that caused it to understate its capacity surplus in its August 2023 filing. NorthWestern understates its summer capacity position by 113 MW and winter by 108 MW due to four flawed assumptions about the capacity value of planned battery and hybrid plants. First, NorthWestern understates planned battery capacity value by 22 MW because it scales down battery capacity value in proportion to the duration of a battery, and Hines presents similar misconceptions about batteries' contributions in his Declaration.[5] Under NorthWestern's methodology, a battery that can deliver its maximum output for two hours receives half as much

[5] Hines Declaration, at 22

capacity credit as a 4-hour battery. This is incorrect, for reasons I explained at length in testimony before the Montana Public Service Commission.[6] As I noted, even analysis commissioned by NorthWestern itself found that 100 MW of 3-hour batteries offer 99% capacity value, only marginally lower than the 100% capacity value offered by 4- and 6-hour batteries of the same size. Second, these results also indicate that NorthWestern's assumption that 4-hour batteries provide only 80% of their nameplate capacity as capacity value is conservative. Increasing this value to the 100% capacity value the NorthWestern-commissioned analysis found for 100 MW of 4-hour batteries would provide an additional 48.5 MW of capacity towards replacing Colstrip.[7]

Third, NorthWestern also understated the capacity contribution of planned solar-battery hybrid resources by basing the capacity accreditation of the solar component on the injection limit of the plant, ignoring that several large planned plants have twice as much solar panel capacity as their injection limit, which is what determines the plant's output during peak demand periods and thus its capacity accreditation. Correcting this error increases NorthWestern's winter capacity by 11 MW and summer capacity by 16 MW. Fourth and finally, in its August 2023 filing NorthWestern incorrectly reduced the capacity value for hybrid resources by 26.5 MW, apparently due to assumed losses and reduced output from using the co-located renewable resources for battery charging. This is incorrect because: (a) under the 2022 Inflation Reduction Act renewable charging is no longer required for a co-located battery to qualify for the investment tax credit; and (b) regardless, renewable charging should not degrade the capacity value of either the battery or the renewable resource because the battery should never charge during a peak demand period that sets resources' capacity contribution.

The third row in the tables shows that with this 108 MW winter capacity and 113 MW summer capacity accreditation correction, NorthWestern can retire Colstrip and have an incremental need for capacity of only 95 MW or less in winter and 25 MW or less in summer for every year from 2027 to 2031, with lower deficits or even surpluses in most years.

The last rows in the tables above show that by simply extending its expiring capacity contracts, NorthWestern could meet this incremental capacity need several times over, swinging from a deficit of 95 MW or less to a surplus of at least 165 MW. As discussed in part A below, it is likely NorthWestern could extend these contracts or sign new capacity contracts. Even NorthWestern's Mr. Hines admits there is a significant likelihood that these contracts could be

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[6] In the Matter of Northwestern Energy's Application for Authority to Increase Retail Electric and Natural Gas Utility Service Rates, Mont. Pub. Serv. Comm'n Dkt No. 2022.07.078, Pre-Filed Direct Testimony of Michael Goggin (Dec. 19, 2022), pages 37-40.

[7] The analysis commissioned by NorthWestern found 200 MW of 4-hour battery storage offer 91% capacity value, so a low estimate is that the 242.5 MW of planned batteries would offer around 220 MW of capacity value, 26 MW more than NorthWestern's assumes based on an 80% accreditation. However, analysis has demonstrated that, due to complementarity between solar and battery output patterns, the quantity of battery capacity that offers full capacity value doubles on power systems that obtain 10% of their annual energy from solar, which NorthWestern should easily exceed based on its planned solar additions. As a result, it is reasonable to assume that NorthWestern's 242.5 MW of planned batteries, 142.5 MW of which have durations of 4 hours and the remainder have durations of 2 or 3.5 hours, will provide nearly 100% capacity value. See Denholm et al., The Potential for Battery Energy Storage to Provide Peaking Capacity in the United States, (June 2019) the National Renewable Energy Laboratory, at 13, available at https://www.nrel.gov/docs/fy19osti/74184.pdf

extended, with his declaration only able to argue that "it cannot be assured that NorthWestern will be able to renew or replace these contracts when they expire, especially under as favorable of terms."[8] As explained below, the large capacity surplus in the region suggests that NorthWestern could likely secure favorable terms for extending or replacing these contracts.

In addition to extending contracts with resources elsewhere in the region, NorthWestern could extend expiring contracts with existing generating resources on its system, though to be conservative this is not accounted for in the tables above. Resources with a winter capacity contribution of 40.6 MW and summer capacity contribution of 29.5 MW have contracts that expire in the next several years and thus are not reflected in the table above,[9] and NorthWestern's contract with the Colstrip Energy Limited Partnership, which has a 50.3 MW summer capacity contribution and 58.9 MW winter contribution, expires in 2028. Renewing contracts with those resources would contribute an additional 80 MW of summer capacity and 99 MW of winter capacity, closing all of NorthWestern's capacity deficit in every year but one if Colstrip retires, though this is not reflected in the tables above.

As another option, NorthWestern could purchase output from new Montana generating resources that have proposed to interconnect to its system. As documented in part B of this section below, there are sufficient resources in the final stages in NorthWestern's interconnection queue with proposed in-service dates prior to July 2027 to meet NorthWestern's incremental capacity need more than 22 times over if Colstrip retires by that date. NorthWestern could also pursue a combination of these strategies, renewing or signing new contracts both with regional capacity resources and with Montana resources. In his Declaration, NorthWestern Vice President John Hines confirms that building new resources or contracting with regional capacity resources are the two primary mechanisms for procuring replacement capacity: "Capacity can be replaced in one of two principal ways: (1) new generation facilities can be built, or (2) electricity can be purchased from third-parties in the electricity market."[10]

This analysis and the analysis in the following section directly refute the claim in Nowakowski's Declaration that Colstrip's retirement "raises serious concerns about grid reliability and transmission."[11] If Colstrip retires, NorthWestern can readily meet any resulting capacity need with dependable capacity from capacity contracts and new Montana resources by 2027. Section II below demonstrates that these resources can match or exceed the reliability contributions of Colstrip. For that reason, it also refutes (1) the claim in Nowakowski's Declaration, citing NorthWestern, that "if Colstrip is closed in the near term, NorthWestern cannot provide adequate and reliable electrical service for its Montana customers without new replacement baseload capacity. Colstrip currently plays an essential role in baseload capacity for NorthWestern…." and (2) the claim made by Hines that "NorthWestern cannot develop replacement electrical

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[8] Hines Declaration, at 20

[9] These resources include the 135 MW Judith Gap wind project and several small hydropower projects. These contract expirations are indicated by the yellow highlighted cells in NorthWestern Energy, Montana Public Service Commission Docket 2023.08.076, Exhibit SIS-3, August 2023.

[10] Hines Declaration, at 10

[11] STATE OF NORTH DAKOTA, et al. *Petitioners*, v. U.S. ENVIRONMENTAL PROTECTION AGENCY *Respondent*. Case No. 24-1119 DECLARATION OF SONJA NOWAKOWSKI, at 5

generation or transmission capacity for Colstrip under either the 2027 or 2032 closure scenarios."[12]

A. NorthWestern can replace Colstrip by signing new capacity contracts or extending existing ones

NorthWestern has historically relied on capacity contracts and market purchases to meet a large share of its capacity and energy needs, benefiting consumers by accessing low-cost generating resources in the Pacific Northwest. For example, its 2019 IRP showed that NorthWestern used market purchases to meet 46% of its capacity needs.[13] Hines's Declaration also notes that when NorthWestern purchased the utility in 2002, "NorthWestern did not own any generation assets to serve Montana customers," so it relied entirely on short- and long-term market purchases.[14] Imports have been a reliable source of energy and capacity, even during extreme weather events like Winter Storm Elliott. NorthWestern itself notes that "During frigid temperatures in December 2022, 41% of NorthWestern Energy's peak Montana energy load was met with market purchases, primarily from out of state."[15] In its 2023 IRP, NorthWestern also documents that during its top three load hours in 2022, it met 38-50% of its demand using imports, including both short-term market purchases and long-term capacity contracts.[16]

NorthWestern can use capacity contracts to replace the capacity provided by Colstrip. NorthWestern currently has 460 MW of summer capacity contracts and 410 MW of winter capacity contracts. These capacity contracts decline to 150 MW by 2027, as 310 MW of summer capacity contracts and 260 MW of winter capacity contracts expire between 2024 and 2027. It is routine for capacity contracts to have durations of less than 5 years, so it is not unusual for a utility that relies on capacity contracts to have apparent shortfalls at their expiration that do not materialize because those contracts are extended or replaced. NorthWestern has historically been able to extend existing contracts or replace them with new capacity contracts. As Tables 1 and 2 illustrate, extending even 40% of these expiring capacity contracts would more than fully meet NorthWestern's capacity needs if Colstrip retires.

The Montana Public Service Commission has directed NorthWestern to evaluate capacity contracts that may be more cost effective than fossil-fuel capacity like Colstrip and new gas plants. As noted in Volume 2 of NorthWestern's 2023 Integrated Resource Plan (IRP), the Montana Public Service Commission staff requested that NorthWestern model capacity purchases as a selectable resource in the IRP modeling, rather than constraining its model to

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[12] Hines Declaration, at 4

[13] NorthWestern, 2019 Electricity Supply Resource Procurement Plan, (August 2019) at https://northwesternenergy.com/docs/default-source/default-document-library/about-us/regulatory/2019-plan/complete-plan.pdf, at 2-13

[14] Hines Declaration, at 13

[15] NorthWestern, NorthWestern Energy/Avista Colstrip Agreement, at https://www.northwesternenergy.com/clean-energy/where-does-your-energy-come-from/electric-generation/colstrip-generating-plant#

[16] Northwestern, Montana IRP 2023, Volume 1 (hereinafter IRP Volume 1), at 51 https://www.northwesternenergy.com/docs/default-source/default-document-library/about-us/erp-irp/2023_montana_irp_final.pdf?Status=Master/2023_Montana_IRP_Final.pdf

disallow such purchases. NorthWestern rejected that request, claiming without evidence that "Capacity contracts are not widely available and NorthWestern is not certain that such contracts will be available in the future."[17]

In fact, NorthWestern has failed to assess the availability of capacity contracts, but data suggest offers are likely available. NorthWestern's last Request for Proposals (RFP) for capacity purchases was in 2020,[18] and there was no shortage of offers at that time. NorthWestern received offers for 350 MW of capacity contracts in response to a 2019 solicitation,[19] and in the 2020 solicitation NorthWestern received an offer for 200 MW of capacity from Powerex, but only "selected 60 MW to match our need,"[20] leaving the other 140 MW of offered capacity uncontracted.

If NorthWestern conducted a new RFP, it may find that availability and pricing of supply contracts have even improved since 2020, in part because the Western Resource Adequacy Program (WRAP)[21] in which NorthWestern and other regional utilities participate is freeing up capacity supplies by reducing regional capacity needs, as documented below. NorthWestern cannot claim capacity contracts are unavailable based on its unwillingness to obtain information from the market about their availability. Notably, NorthWestern's capacity tally from August 2023 includes 100 MW of contracts that began providing capacity in the fall of 2023 but were not reported in the IRP it released in May 2023,[22] suggesting NorthWestern was able to recently secure new capacity contracts. This confirms that capacity contracts continue to be available in the market. Because both existing and new capacity contracts are supplied by operating generating resources in the region, such contracts can easily be put in place in time to replace Colstrip. In fact, NorthWestern's last solicitation for capacity contracts in July 2020 resulted in supply contracts being in place by the end of 2022,[23] and the 2023 contracts discussed earlier in this paragraph appear to have been finalized only shortly before they began providing capacity. These examples suggest that NorthWestern could secure replacement capacity contracts that would take effect before Colstrip's possible retirement, even if NorthWestern waits to obtain more certainty about Colstrip's fate.

Capacity contracts are likely available because the Pacific Northwest region has a large capacity surplus for the foreseeable future, contrary to claims in Nowakowski's Declaration. Her

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[17] Northwestern, Montana IRP 2023, Volume 2 (hereinafter IRP Volume 2), at 10, available at https://northwesternenergy.com/docs/default-source/default-document-library/about-us/erp-irp/2023_montana_irp_volume_2_final.pdf

[18] IRP Volume 1, at 41

[19] NorthWestern, 2020 Supplement to the 2019 Electricity Supply Resource Procurement Plan, (December 2020) at https://www.northwesternenergy.com/docs/default-source/documents/defaultsupply/2020_supplement_to_2019_procurement_plan.pdf at 25

[20] NorthWestern response to data request MEIC-17 in Montana Public Service Commission Docket No. 2022.07.078

[21] WRAP is a new program that will reduce generating capacity needs across the Western Interconnect by allowing utilities to tap into timing diversity in when they experience peak demand and lulls in generation output. For more information, see https://www.westernpowerpool.org/news/wpp-announces-ferc-approval-of-wrap-tariff.

[22] IRP Volume 1, at 39, Figure 6-2

[23] Hines Declaration, at 16

Declaration presents obsolete information about supply chain constraints hampering the development of new generation, and incorrectly focuses on capacity supplies across all of the Western Interconnection. However, the Pacific Northwest subregion has a large capacity surplus, and that is the area that is relevant for NorthWestern and its ability to contract with resources that count towards its participation in WRAP's Pacific Northwest subregion. The North American Electric Reliability Corporation's (NERC's) most recent Long-Term Reliability Assessment shows the Pacific Northwest region that includes Montana and its electrically interconnected neighbors has a capacity surplus that is around twice its planning reserve margin through the year 2031.[24] The regional capacity surplus is also increasing as WRAP reduces reserve margin needs and increases resources' capacity accreditation by tapping into regional diversity in electricity supply and demand patterns, as NorthWestern itself has documented.[25]

Other regional reports have similarly found large regional and subregional capacity surpluses. The Western Electricity Coordinating Collaborative's (WECC's) most recent report that is focused on the Northeast subregion that includes NorthWestern found a large drop in reliability risk relative to the prior report, reflecting that "Over the next 10 years, entities plan to build 11 GW of new resources. Most of the new resources are expected to be online in the next four years and consist mainly of natural gas with some solar, wind, and battery storage."[26] WECC's 2023 WECC-wide study also shows an improved capacity outlook, even with expected load growth over the next 10 years increasing from 9.6% to 16.8%, noting a large reduction in the risk of capacity supply shortfalls.[27]

It is worth noting that for over a decade NorthWestern has been claiming that regional supply shortfalls are imminent. For example, a summary of past IRP filings in NorthWestern's 2019 IRP notes that "The 2013 Plan also recognized the potential for future imbalances between regional loads and resources due to the announced closures of several coal plants and plans by other utilities in the region to rely more heavily on market purchases to serve their loads," and that NorthWestern repeated those claims in its 2015 and 2019 IRPs.[28] Those concerns have not materialized, and the NERC data presented above show the Pacific Northwest continues to enjoy large capacity surpluses through 2031.

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[24] By action of the Federal Energy Regulatory Commission (FERC), NERC has been established as the Electric Reliability Organization for the United States, the entity tasked with ensuring electric reliability. NERC, *Long-Term Reliability Assessment* (December 2023) https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2023.pdf, at 117

[25] IRP Volume 1, at 21

[26]WECC, Western Assessment of Resource Adequacy: Sub-Regional Risks: NWPP-NE, (November 2022)

https://www.wecc.org/Reliability/NWPP-NE%20Subregional%20Assessment%202022.pdf, at 3

[27] "Demand-at-risk hours over the next 10 years decreased compared to the 2022 Western Assessment, but they were not eliminated." WECC, 2023 Western Assessment of Resource Adequacy, at https://www.wecc.org/Administrative/2023%20Western%20Assessment%20of%20Resource%20Adequacy%20Overview.pdf

[28] NorthWestern, 2019 Electricity Supply Resource Procurement Plan, (August 2019) at https://northwesternenergy.com/docs/default-source/default-document-library/about-us/regulatory/2019-plan/complete-plan.pdf, at 2-3

B. NorthWestern can replace Colstrip with new Montana resources

NorthWestern's interconnection queue includes more than 12,400 MW of proposed generating resources, nearly all of which are located in Montana.[29] Over 11,200 MW of those resources have proposed in-service dates prior to the MATS effective date of July 8, 2027, when Nowakowski and Hines allege that Colstrip could retire.[30] 1,460 MW of those resources are under construction or have a signed interconnection agreement, the last step in the interconnection process, including 615 MW that does not appear to be included in NorthWestern's August 2023 capacity tally shown in Tables 1 and 2 above.[31] These resources with 615 MW of nameplate capacity could offer around 400 MW of additional accredited capacity that is not included in NorthWestern's tally, more than enough to meet NorthWestern's possible capacity need several times over.

NorthWestern's August 2023 capacity tally also overlooks the potential to bring capacity online from an additional 6,100 MW of resources in NorthWestern's queue that have proposed in-service dates prior to July 2027 and have completed the Facilities Study, which gives a resource a definitive interconnection cost and is the last stage of the interconnection study process prior to signing an interconnection agreement. Combined with the 615 MW discussed above, more than 6,700 MW of generating projects with certain interconnection costs and proposed in-service dates prior to Colstrip's potential retirement date are not accounted for in NorthWestern's supply tally. The total capacity accreditation of these resources is around 2,600 MW in the summer and 2,150 MW in the winter.[32] This is enough to meet NorthWestern's capacity need if Colstrip retires about 22 times over. Said another way, if NorthWestern brought online less than 5% of the resources that have completed the last stage of the interconnection process and have proposed in-service dates before July 2027, it would be more than enough to meet its capacity need if Colstrip retires.

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[29] An interconnection queue is a list of proposed generation projects that have applied to interconnect to a grid operator's system. Projects advance through three stages of studies before receiving a definitive interconnection cost in the Facilities Study, at which point the project can sign an interconnection agreement and proceed with construction. The quantity of projects in the queue, and particularly the quantity of projects in later stages of the interconnection process that have completed a Facilities Study or signed an interconnection agreement, are routinely used as an indicator of potential generation additions. NorthWestern's current interconnection queue can be accessed at http://www.oasis.oati.com/nwmt/nwmtdocs/Interconnection_queue.xls, updated June 13, 2024, accessed July 9, 2024

[30] Nowakowski Declaration at 7, Hines Declaration at 3

[31] The total capacity of queue resources with signed interconnection resources that are not included in NorthWestern's tally is actually 695 MW, but the 80 MW "UDA" solar project that is included in NorthWestern's capacity tally could not be mapped to a specific queue project, so 80 MW was subtracted from the queue resources' nameplate capacity. The UDA project only offers 5 and 7 MW of winter and summer capacity value, so it has a negligible impact on accredited capacity.

[32] Based on the capacity accreditation rates NorthWestern used in its capacity tally presented in Tables 1 and 2.

For the majority of these projects, the interconnection costs identified in the Facilities Study are quite low, removing a hurdle that can prevent a proposed generator from coming online.[33] Moreover, for nearly all of these projects, the timeline NorthWestern has provided for completing the grid upgrades required to interconnect the resource is less than 36 months. As a result, interconnection timelines should not pose a barrier to bringing enough of these resources online to replace Colstrip by July 2027.

Without evidence, Nowakowski alleges that "A timeline of three years to conduct the siting, development, construction and commissioning of the energy supply resources, demand side resources, and/or transmission assets required to meet those energy and capacity demands, in accordance with local, state, and federal permitting and interconnection requirements, is inadequate."[34] Similarly, Hines argues that "First, replacement capacity has long planning, permitting, and construction times."[35] These claims ignore that many of the proposed resources in NorthWestern's interconnection queue have made substantial progress towards completing the development steps that take the longest, like interconnection studies.

Moreover, as both the transmission service provider conducting the interconnection process and the potential purchaser of a resource's output, NorthWestern has extensive control over the fate and timing of resources in the queue. Not all projects in the queue come online, and others can be delayed, but in many cases project delays and failures are primarily due to an inability to find a purchaser for their output. If NorthWestern contracted to purchase the output of some of these resources, that would provide them with the certainty needed to obtain financing and move forward to construction, which alone would be enough to close NorthWestern's capacity deficit if Colstrip retires. Construction timelines for new resources are quite short: wind plants can generally be built in less than one year,[36] solar plants less than two years[37] with portions of the facility typically brought online as they are completed, and in some cases battery plants have been installed in a matter of months.[38]

NorthWestern's own 2023 IRP analysis shows it could, at that time, reliably replace Colstrip by 2025. The "Colstrip Retirement in 2025 with renewable replacements" scenario found that, with an incremental addition of 650 MW of storage capacity and a reduction in gas capacity of 118 MW relative to the base case, Colstrip could be retired in 2025 and NorthWestern would have enough resources to meet its need.[39]

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[33] For data showing many resources that withdraw from the interconnection queue have much higher interconnection costs than projects that move forward to completion, see J. Rand et al., Queued Up: 2024 Edition, at https://emp.lbl.gov/sites/default/files/2024-04/Queued%20Up%202024%20Edition_R2.pdf

[34] Nowakowski Declaration, at 7

[35] Hines Declaration, at 5

[36] NextEra Energy Resources: Wind Energy, at https://www.nexteraenergyresources.com/what-we-do/wind.html

[37] Solar Energy Industries Association, Development Timeline for Utility-Scale Solar Power Plant, at https://www.seia.org/research-resources/development-timeline-utility-scale-solar-power-plant

[38] T. Ong, Elon Musk has finished building the world's biggest battery in less than 100 days (November 2018), at https://www.theverge.com/2017/11/23/16693848/elon-musk-worlds-biggest-battery-100-days

[39] IRP Volume 1, at 75

The results of other studies confirm that, with new resources and the capacity benefits from its participation in WRAP, NorthWestern can retire Colstrip without encountering reliability concerns. Recent analysis of regional reliability by Energy Strategies and GridLab shows that WRAP greatly improves NorthWestern's reliability,[40] causing a large capacity surplus in 2026. The analysis found that there may be a capacity need by 2030,[41] though that was based on conservative assumptions that existing capacity contracts expire and new resources are not developed which, as explained above, do not reflect likely or necessary future scenarios. The study did confirm that the development of additional wind and storage resources would improve NorthWestern's capacity position. Moreover, the study found a large reduction in capacity need for NorthWestern and the region if WRAP evolves to include resource sharing across the West and not just within the Northwest region, due to diversity benefits in the timing of peak demand and resource output between the Northwest and other parts of the West. The study found this would result in NorthWestern having a large capacity surplus.

II. NEW RESOURCES CAN MATCH OR EXCEED THE RELIABILITY CONTRIBUTIONS OF COLSTRIP

As noted above, Nowakowski's Declaration cites NorthWestern claiming that "Colstrip currently plays an essential role in baseload capacity for NorthWestern."[42] However, the above analysis shows that Colstrip is not essential, as NorthWestern can readily replace its capacity contributions using its existing capacity surplus as well as by signing contracts with existing or new capacity resources in the region or in Montana. Analysis in this section indicates Colstrip regularly fails to perform during peak demand periods, and that a portfolio of replacement resources could match or exceed its contributions across a range of reliability services.

It is noteworthy that Nowakowski's Declaration cites NorthWestern using the obsolete and largely meaningless term "baseload" to defend the importance of Colstrip. In his Declaration, Hines also argues that "Second, there are promising developing alternatives to baseload fossil fuel energy sources, but these require additional time to mature."[43] Baseload plants like Colstrip were simply those that ran most of the time because they provided low-cost energy. Baseload plants also provided some capacity to meet peak load, but they did not typically provide much flexibility. The three primary services that the grid needs from generators are energy, capacity to meet peak demand, and flexibility (the ability to change MW output over time). Baseload plants were one potential source of energy and capacity, but they are no longer the lowest-cost source for those services. With the growth of lower-cost energy resources like wind and solar (and combined cycle generators in regions with low-cost gas), and flexible capacity resources like batteries and gas generators, many traditional baseload resources are no longer economic and are retiring.

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[40] GridLab, Assessing Resource Adequacy in Montana, at 18 (Dec. 2023), at https://gridlab.org/wp-content/uploads/2024/06/GridLab-Montana-RA-Study_Dec-2023_update1.pdf at 18

[41] *Id.*, at 29

[42] Nowakowsi Declaration, at 5

[43] Hines Declaration, at 5

Baseload is not and has never been a distinct reliability service. Many people claiming a need for baseload are referring to a need for capacity. However, many other resource types like storage, gas generators, hydropower, and even portfolios of wind and solar resources, provide capacity value that is just as dependable, if not more dependable, than that provided by traditional baseload resources like coal-fired power plants. This is confirmed by the WRAP capacity accreditations for existing and potential replacement resources presented in Section I above. These potential replacement resources also contribute more to flexibility and a range of other essential grid reliability services than coal generators, as illustrated in the following table from an article published by a former national laboratory researcher in the *Electricity Journal*.[44]

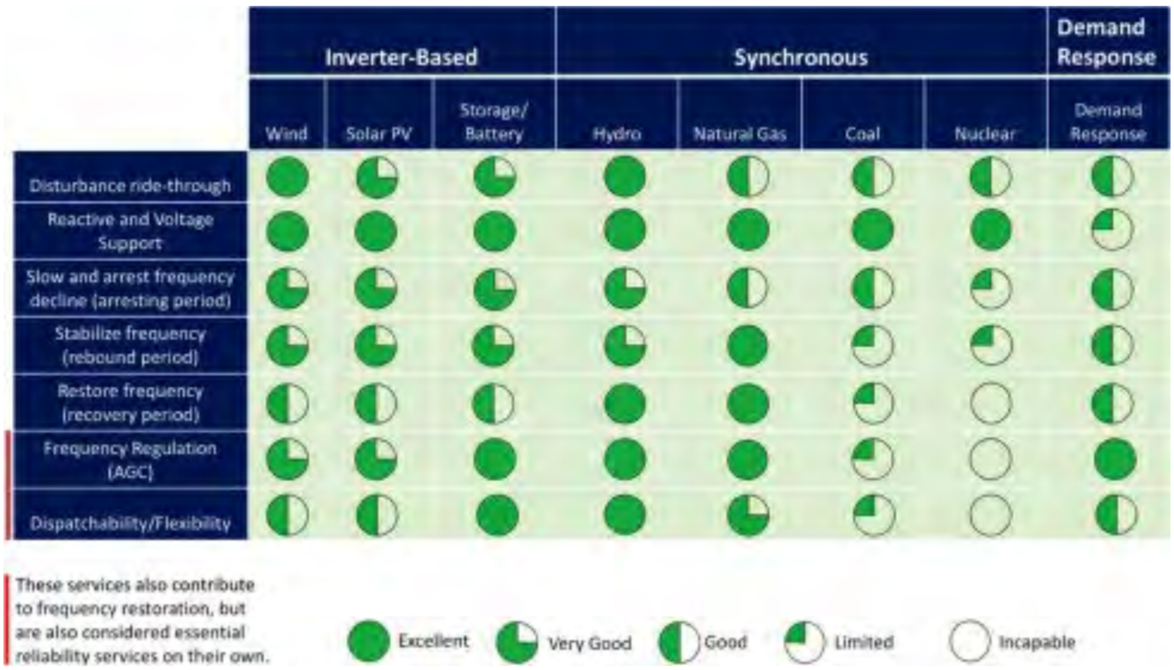

Figure 1: Reliability Services Provided by Each Resource Type, from *Electricity Journal*

A. Colstrip often fails to perform during peak demand periods

NorthWestern and Nowakowski overstate Colstrip's reliability contributions. In the capacity surplus projections presented in Section I, NorthWestern assumed a very optimistic 99.51% winter and 98.29% summer capacity value for Colstrip, apparently based on WRAP's accreditation that is calculated from historical performance. As documented below, Colstrip has failed to perform during both summer and winter peak demand periods, contrary to the claims in Nowakowski's Declaration. Thus, calculations of Colstrip's capacity value are likely to decline significantly once WRAP's historical data is updated to account for Colstrip's recent poor performance during periods of peak demand. This reduces the quantity of Colstrip replacement resources that are needed to match NorthWestern's current level of reliability, making the analysis presented in Section I above conservative.

[44] M. Milligan, "Sources of grid reliability services," Electricity Journal Vol. 31, Issue 9 (Nov. 2018), at https://www.sciencedirect.com/science/article/pii/S104061901830215X#tbl0005.

Even without a reduction in WRAP accreditation, for its own planning and operating purposes NorthWestern needs to account for the risk to its system from its dependence on a single large resource. A utility relying on any one plant to meet one-third of its retail load is unwise, particularly if it is an aging plant with a history of failures during periods of high demand like Colstrip. Replacing Colstrip with a portfolio of wind, solar, and storage resources, as well as long-term capacity purchases, will improve reliability and resilience. These replacement resources are not subject to the same types of outages as fossil resources, and thus reduce NorthWestern ratepayers' exposure to both economic and reliability risks. As the WRAP capacity accreditation rates included in NorthWestern's resource tally show, wind and solar work together to help meet demand during both summer and winter peak periods. The synergistic hourly and seasonal output profiles of solar and wind resources, with solar producing during the summer and the day and wind producing more during the winter and at night, can be further complemented by storage resources and imports filling in when those resources are unavailable.

The Hines and Nowakowski Declarations greatly overstate Colstrip's performance during recent peak demand events. They point to Colstrip's performance during a January 2024 cold snap,[45] yet in reality the plant had low availability for critical periods of that event because Unit 4 was taken offline to repair a tube leak.[46] Hourly gross generation and load data[47] presented in the chart below shows that Colstrip Unit 4 was still offline on the morning of January 12, and had limited output during the midday and evening peak demand periods as it was still ramping up. This shortfall contributed to around $40 million in total costs to Montana ratepayers for power purchases during the cold snap.[48]

[45] See Nowakowski Declaration at 6: "However, during the peak of record setting electricity demand in the NorthWestern Balancing Authority driven by a severe cold weather event in January 2024, coal fired EGUs within the balancing authority generated seventy five percent of the customer electricity demand…," and Hines Declaration at 23: "During the Winter of 2023-2024, thermal generation, especially Colstrip, played a key role in helping provide reliable and affordable service."

[46] S. Ernst, "Small Tube Leak Took Colstrip Unit 4 Down for Short Time During Winter Storm," Newsdata (Feb. 16, 2024), at https://www.newsdata.com/clearing_up/briefs/small-tube-leak-took-colstrip-unit-4-down-for-short-time-during-winter-storm/article_561c3782-ccee-11ee-a878-b3b3035097e1.html.

[47] Hourly NorthWestern Balancing Authority load data from EIA-930, available at https://www.eia.gov/electricity/gridmonitor/knownissues/xls/NWMT.xlsx, and hourly Colstrip generation data from EPA CEMS, available at https://campd.epa.gov/data/custom-data-download. Note that EPA CEMS data reports gross generation, so the net generation Colstrip was able to deliver to the grid after meeting parasitic loads at the plant would be lower than indicated in the chart.

[48] K. Szpaller, January 2024 cold snap to cost NorthWestern customers $39M, The Daily Montanan (Mar. 7, 2024), at https://dailymontanan.com/2024/03/07/january-2024-cold-snap-to-cost-northwestern-customers-39m/

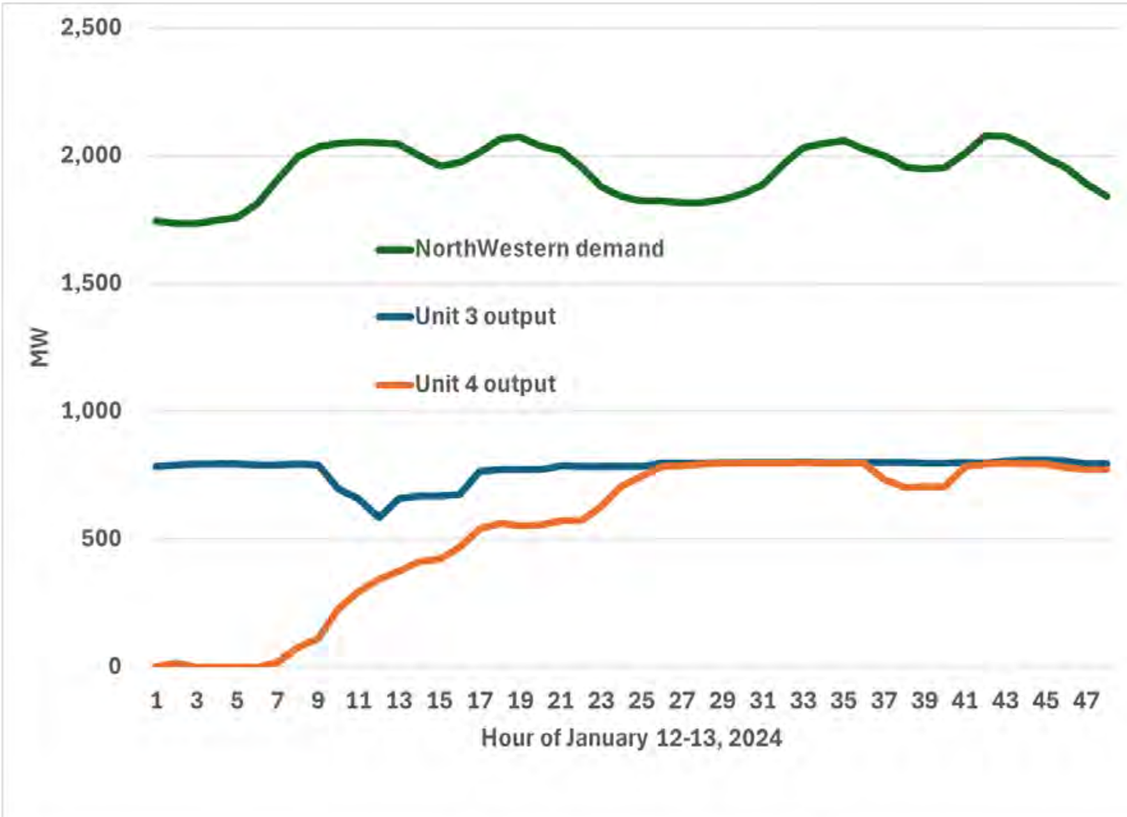

Figure 2: Colstrip gross output and NorthWestern demand on January 12-13, 2024

Colstrip has also failed during other peak demand periods. Colstrip was mostly unavailable during several heat waves in the summer of 2018. As shown in Figure 3 below, Colstrip Unit 4 was offline for the highest demand days that year, August 9 and 10, while Unit 3 also had reduced availability during that heat wave. Figure 4 indicates that Unit 4 was also offline for the second highest demand period that year, July 10-13, while Unit 3 had low output or was offline entirely.

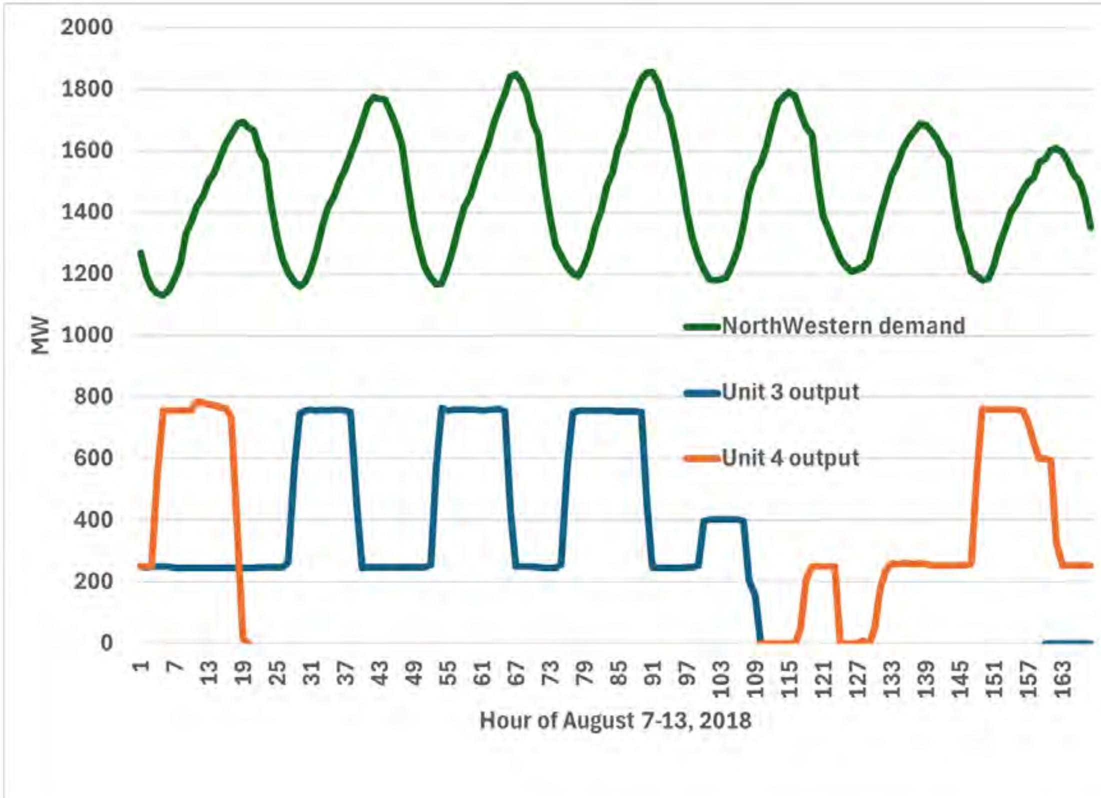

Figure 3: Colstrip gross output and NorthWestern demand on August 7-13, 2018

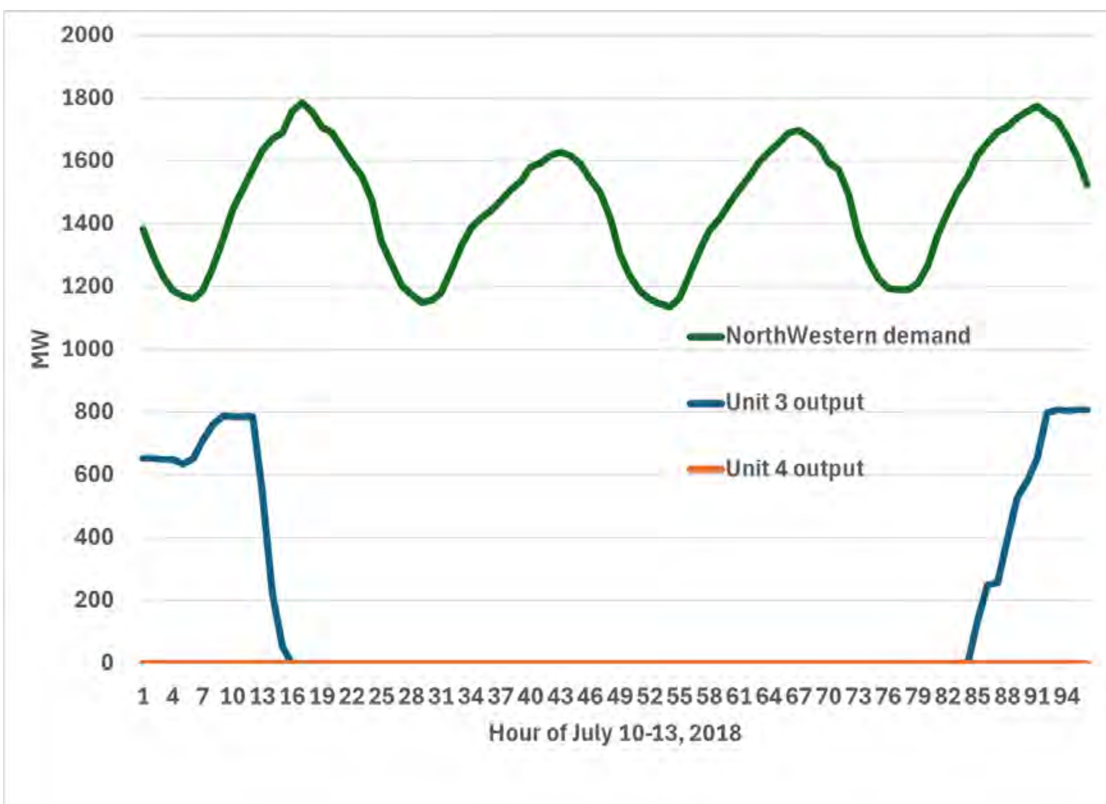

Figure 4: Colstrip gross output and NorthWestern demand on July 10-13, 2018

The modeling in the GridLab and Energy Strategies study cited above supports the conclusion that Colstrip's capacity contribution is much lower than NorthWestern assumes. In fact, that modeling indicates that NorthWestern's 444 MW of nameplate capacity from Colstrip only provides 226 MW of dependable capacity,[49] a capacity accreditation of only 50.9%, or roughly half of the 98.3-99.5% accreditation NorthWestern assumes for Colstrip in its capacity tally.

B. New renewable and storage resources can help address any local reliability needs resulting from the retirement of Colstrip

Even setting aside Colstrip's particularly poor performance, as illustrated in Figure 1 above, renewable and storage resources can match or exceed the contributions of coal power plants towards nearly every category of reliability services. Renewable and battery storage resources are digitally controlled using sophisticated power electronics, allowing them to regulate frequency and voltage orders of magnitude more quickly than conventional resources can using their rotating equipment. Renewable and battery storage resources are now required by FERC to match the contributions to reactive power and voltage control provided by conventional generators.[50] As a result, replacing Colstrip with renewable and battery storage resources can help meet any local need for reliability services at Colstrip or along the Colstrip Transmission System (CTS), the 500-kiloVolt transmission lines that run westward across Montana from Colstrip to access load centers in the Pacific Northwest.

Many of the interconnection queue resources tallied in Section I above are proposing to directly interconnect at Colstrip or along the CTS, which would help provide local voltage and stability support and other reliability services. If there are any local stability or system strength concerns, these batteries or renewable resources can be equipped with grid-forming controls instead of the grid-following controls that are typically used.[51] Grid-forming controls are increasingly being used in applications where voltage, stability, or short circuit strength concerns emerge.

The Hines Declaration[52] cites the claim in NorthWestern's IRP that retiring Colstrip will require the installation of reactive power devices to regulate voltage.[53] NorthWestern's estimated cost of $20-30 million for these devices is small relative to the ongoing cost of operating Colstrip[54] and

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[49] GridLab, Assessing Resource Adequacy in Montana, at 18 (Dec. 2023), at https://gridlab.org/wp-content/uploads/2024/06/GridLab-Montana-RA-Study_Dec-2023_update1.pdf.

[50] FERC, Order 827, Reactive Power Requirements for Non-Synchronous Generation, 155 FERC ¶ 61,277 (June 16, 2016) (codified at 18 C.F.R. Part 35), at https://ferc.gov/sites/default/files/2020-06/RM16-1-000.pdf

[51] NERC, Grid Forming Technology: Bulk Power System Reliability Considerations (Dec. 2021), at https://www.nerc.com/comm/RSTC_Reliability_Guidelines/White_Paper_Grid_Forming_Technology.pdf

[52] Hines Declaration, at 25

[53] "NorthWestern's analysis concluded that imports from off-system resources cannot control voltage in the same way that the generation at Colstrip can control voltage, and an immediate loss of Colstrip would create high voltage problems on the transmission system. An installation of reactors would be required to mitigate this high voltage." IRP Volume 1, at 48

[54] Montana Environmental Information Center, Deeper Dive into Costs and Risks of Colstrip, at https://meic.org/wp-content/uploads/2020/04/Colstrip-202-CU4-Presentation-1.pdf

does not justify continued operation of Colstrip. However, as I explained in my critique of NorthWestern's 2023 IRP,[55] the voltage and reactive power analysis in the IRP only examined scenarios in which large amounts of wind energy were used to replace Colstrip, and found that additional reactive power and voltage regulation would be required during periods of low wind output.[56] If NorthWestern had used a more realistic and diverse portfolio of wind, solar, and storage resources to replace Colstrip, instead of only using wind, it could have reduced or eliminated those concerns. This is partially because a portfolio of wind, solar, and storage resources has more consistent output, with solar and wind tending to produce at opposite times of the day and year, and storage filling in when they are not available. In addition, solar and storage resources can be configured so that their power electronics can use grid power to provide voltage and reactive power support, even when the plant is not producing real power. For example, the power electronics of solar plants can be configured to provide reactive power and voltage support at night, at a much lower cost than installing new reactive power devices.[57]

III. TRANSMISSION CONSTRAINTS DO NOT LIMIT NORTHWESTERN'S ABILITY TO IMPORT POWER

The Declarations by Nowakowski and NorthWestern officials[58] claim that there is insufficient transmission capacity to import sufficient resources to replace Colstrip. The clearest rebuttal to this claim is NorthWestern's own data from its IRP showing that during its top three load hours in 2022, it met 38-50% of its demand using imports, including both short-term market purchases and long-term capacity contracts.[59] As noted above, NorthWestern has relied on imports to reliably meet a large share of its needs for decades, and import transmission capacity has only increased and not decreased over time. Montana generation has also grown with additions of wind, solar, and gas generation, freeing up transmission capacity for additional imports. The following figure from NorthWestern's IRP also shows that total import capacity into Montana totals more than 2,700 MW, more than twice NorthWestern's peak retail load.

[55] M. Goggin, Review of NorthWestern's 2023 IRP, (August 2023) at https://meic.org/wp-content/uploads/2023/08/8-28-2023-Goggins-2023-NWE-IRP-Testimony-on-behalf-of-MEIC.pdf

[56] IRP Volume 2, Appendix G, at 102-104

[57] SMA America LLC, Q at Night, at https://cdn.sma.de/fileadmin/content/www.sma-america.com/docs/Q%40NIGHTWP-UUS134511P.pdf?v=1660809118&_ga=2.42114413.915951628.1690554640-246618966.1690554640 In particular, see page 9: "The investment costs of the option "Q at Night" are significantly lower in comparison to the costs for compensation plants. In particular, the savings are considerable compared to dynamic compensation plants."

[58] See the Declaration of Michael Cashell filed in December 2023 as part of NorthWestern's comments on the EPA rule, and which was included in Petitioners Talen Montana and NorthWestern's Joint Motion for Stay and is repeatedly referenced in the Hines Declaration.

[59] IRP Volume 1, at 51

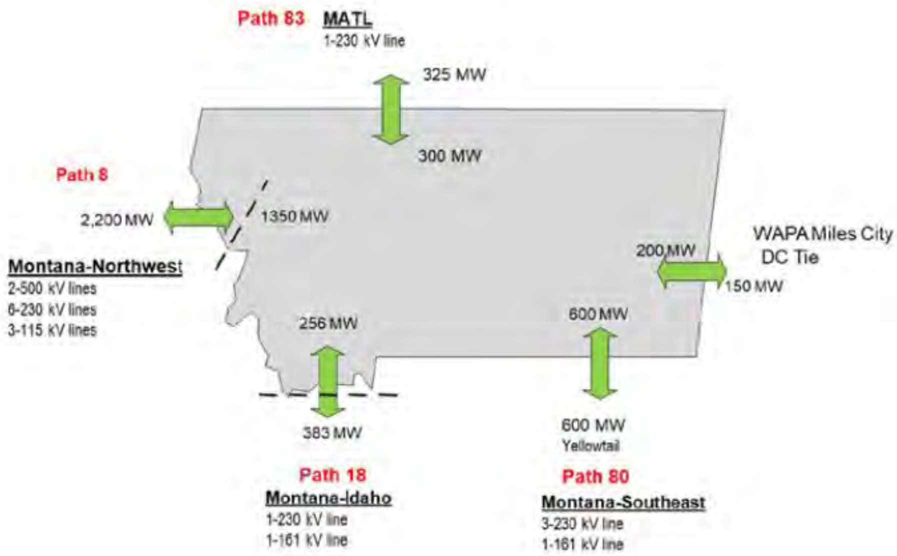

Figure 5: Montana transmission import capacity, from NorthWestern IRP[60]

I more comprehensively addressed these claims about limited import capacity in recent testimony before the Montana Public Service Commission,[61] where I was rebutting claims made by Mr. Cashell that are nearly identical to the claims put forward in his December 2023 Declaration that was appended to the Joint Motion for Stay. For example, WECC data for 2018 show that transmission capacity on Path 8, the tie between Montana and the Northwest, never exceeds 90% utilization in summer, and only reaches that level of utilization 0.8% of the time in winter,[62] indicating there is spare transmission capacity on that interface. Historically there has been little west-to-east flow across Path 8,[63] so presumably most if not all of the time periods when the interface experiences more than 90% utilization are exports out of Montana and not imports to NorthWestern. Regardless, claims about import capacity do not affect NorthWestern's ability to replace Colstrip with the large quantity of Montana resources in the interconnection queue that was documented in Section I.B. above.

CONCLUSION

This report refutes claims made in Declarations by Montana and NorthWestern Energy officials that the retirement of Colstrip, if it occurred, would pose a risk to electric reliability. NorthWestern can use the massive supply of existing and new generating resources in Montana

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[60] *Ibid.*, at 54

[61] In the Matter of Northwestern Energy's Application for Authority to Increase Retail Electric and Natural Gas Utility Service Rates, Mont. Pub. Serv. Comm'n Dkt No. 2022.07.078, Pre-Filed Direct Testimony of Michael Goggin (Dec. 19, 2022), pages 30-33.

[62] WECC, State of the Interconnection: Transmission Adequacy, at https://www.wecc.org/epubs/StateOfTheInterconnection/Pages/Transmission-Adequacy.aspx

[63] WECC, WECC Path Reports, (September 2013) at https://www.wecc.org/Reliability/TAS_PathReports_Combined_FINAL.pdf

and the broader Northwest region to replace Colstrip many times over by the time Colstrip may retire. This portfolio of replacement resources can match or exceed Colstrip's contributions across a range of reliability services, in part because Colstrip often fails to perform during periods of peak electricity demand.

ORAL ARGUMENT NOT YET SCHEDULED

IN THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

State of North Dakota, et al., Petitioners, **v.** **United States Environmental Protection Agency,** Respondent.	Case No. 24-1119 (and consolidated cases)

DECLARATION OF SARAH JOHNSON, AIR QUALITY PROGRAM, NEW YORK CITY DEPARTMENT OF HEALTH AND MENTAL HYGIENE

I, Sarah Johnson, declare as follows,

I. Purpose of this Declaration

1. I am the Executive Director of the Air Quality Program at the New York City Department of Health and Mental Hygiene ("DOHMH"). I submit this declaration in support of the joint motion of the Commonwealth of Massachusetts and the City of New York, among other states and cities (collectively, "Movant State and Local Governments"), to intervene as Respondents in support of the Environmental Protection Agency's ("EPA's") National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review (the "Final Rule").

II. Experience and Qualifications

2. I earned a Bachelor's degree in Biology from University of North Carolina, Chapel Hill, a Master's of Science in Ecology from University of California, Davis and a Master's of Public Health from University of California, Berkeley.

3. I have been the Executive Director of the Air Quality Program at DOHMH since 2018. Prior to my current role, I served as a Senior Spatial Analyst with the Air Quality Program. In that role, I executed spatial and statistical analyses to predict air pollution distribution, health effects, and inform program planning and evaluation.

4. DOHMH, New York City's public health agency, performs a wide-ranging portfolio of services for the City and its residents. One unit providing such services is the Bureau of Environmental Science and Policy in the Division of Environmental Health, which collects and analyzes crucial environmental and health data, including factors related to air quality, climate change, and health outcomes, among others.

5. In my current capacity, I oversee DOHMH's research related to air quality and its relation to health outcomes such as premature deaths and hospital visits. A major component of the air quality program is the New York City Community Air Survey ("Survey"), which measures black carbon, nitrous oxides,

ozone, sulfur dioxide, and fine particulate matter (“$PM_{2.5}$”) across 78 sites citywide. These sites, which measure pollution at the street level, where people spend most of their time, provide detailed information that supplements information gathered from federally required building-mounted monitors throughout the City.

6. Coal- and oil-fired electric utility steam generating units (“EGUs”) subject to the EPA’s National Emission Standards for Hazardous Air Pollutants (“HAPs”) are major sources of HAPs, $PM_{2.5}$, and other harmful air pollutants, which endanger New Yorkers’ health and well-being.

III. AIR POLLUTION IN NEW YORK CITY ADVERSELY IMPACTS NEW YORKERS’ HEALTH AND WELL-BEING

7. Exposure to HAPs, including mercury, lead, arsenic, chromium, nickel and cadmium, can cause a wide range of human health harms, including neurological, immunological, reproductive, and genetic injuries, and increased risk of pulmonary and cardiovascular disease.[1]

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[1] David L. MacIntosh et al., Env’t Health & Eng’g, Inc., *Emissions of Hazardous Air Pollutants from Coal-Fired Power Plants* 5, tbl.1, 35 (2011), https://www.lung.org/getmedia/25962184-d2fc-42f8-b5a3-8ece3257fbab/emissionsofhazardous-air.pdf; Muhammad E. Munawer, *Human Health and Environmental Impacts of Coal Combustion and Post-Combustion Wastes*, 17 J. Sustainable Mining 87, 89, fig. 1, 93, tbl. 1 (2018), https://www.sciencedirect.com/science/article/pii/S2300396017300551; 88 Fed. Reg. 24,854, 24,857 (Apr. 24, 2023); 77 Fed. Reg. 9304, 9310 (Feb. 16, 2012); 76 Fed. Reg. 24,976, 24,978, 24,994-95 (May 3, 2011).

8. Since 2004, mercury exposure among New York City adults has substantially decreased.[2]

9. Despite this substantial progress, New Yorkers are still exposed to mercury. As of 2014, 12.1% of the New York City adult population had elevated blood total mercury levels, defined as 5µg/L or greater.[3]

10. Mercury exposure is linked to an increased risk of diabetes,[4] autoimmune dysfunction,[5] and is strongly correlated with adverse and fatal cardiovascular effects.[6] Children *in utero* and in early developmental stages are

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[2] Wendy McKelvey et al., *Tracking Declines in Mercury Exposure in the New York City Adult Population, 2004-2014*, J Urban Health 813, 813, (2018), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6286276/.

[3] New York City Dep't of Health, *NYC Health and Nutrition Examination Survey*, https://a816-health.nyc.gov/hdi/epiquery/visualizations?PageType=ps&Population Source=HANES (last visited May 30, 2024).

[4] Ka He et al., *Mercury Exposure in Young Adulthood and Incidence of Diabetes Later in Life: The CARDIA Trace Element Study*, 36 Diabetes Care 1584, 1587 (2013), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3661833/pdf/1584.pdf.

[5] Jennifer F. Nyland et al., *Biomarkers of Methylmercury Exposure Immunotoxicity among Fish Consumers in Amazonian Brazil*, 119(12) Env't Health Persp. 1733, 1736–37 (2011), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3261989 /pdf/ehp.1103741.pdf.

[6] Giuseppe Genchi et al., *Mercury Exposure and Heart Diseases*, 14(1) Int'l J. Env't Rsch. & Pub. Health 1, 8–9 (2017), https://www.ncbi.nlm.nih.gov/pmc/ articles/PMC5295325/pdf/ijerph14-00074.pdf.

particularly susceptible to mercury exposure,[7] which can cause permanent neurological damage.[8]

11. Exposure to non-mercury HAPs is associated with a wide range of serious health conditions, including adverse neurological, cardiovascular, immunological, reproductive, liver, kidney, and respiratory effects, as well as cancer.[9] Exposure to a mixture of these metals can be especially dangerous.

12. New Yorkers are additionally exposed to non-HAP air pollution, most significantly $PM_{2.5}$. In 2022, the citywide average $PM_{2.5}$ concentration was 5.8 mcg/m^3, a decrease of 46% since 2009.[10] This decrease was driven, in part, by the implementation of Mercury and Air Toxic Standards.[11]

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[7] Stephanie Bose-O'Reilly et al., *Mercury Exposure and Children's Health*, 40(8) Current Probs. in Pediatric & Adolescent Health Care 186, 186 (2010), https://doi.org/10.1016/j.cppeds.2010.07.002.

[8] 76 Fed. Reg. at 25,018; *see also* Pub. Health & Env't, World Health Org., *Exposure to Mercury: A Major Public Health Concern* 3 (2021), https://iris.who.int/bitstream/handle/10665/340715/9789240023567-eng.pdf?sequence=1 (neurological symptoms of prenatal methylmercury exposure can include "intellectual disability, seizures, vision and hearing loss, delayed development, language disorders and memory loss").

[9] Raina M. Maier et al., *National Institute of Environmental Health Sciences Superfund Research Centers at the University of Arizona and University of New Mexico, Prepared for Applied Environmental Law and Policy, Toxicity Review of Metals Emissions from Coal Fired Power Plants,* 10-11 (Mar. 2022).

[10] NYC Environmental & Health Data Portal, *Air Quality*, https://a816 dohbesp.nyc.gov/IndicatorPublic/data-explorer/air-quality/?id=2023#display =summary.

[11] Eric J. Mei et al., *Impacts of Fuel Prices and Regulations on Electricity Generation Emissions and Urban Air Quality*, ACS EST Air 2024, 1, 103-12 (2024), https://pubs.acs.org/doi/epdf/10.1021/acsestair.3c00034.

13. This pollution poses significant risks to New Yorkers' health. $PM_{2.5}$ can cause or exacerbate asthma, cancer, strokes, lung disease, and cardiovascular disease.[12] $PM_{2.5}$ pollution contributes to approximately 2,000 deaths and 5,150 hospital visits annually in New York City.[13]

IV. THE HEALTH IMPACTS FROM HAPS AND $PM_{2.5}$ ARE NOT EXPERIENCED EQUALLY CITYWIDE

14. Health impacts from HAPs and $PM_{2.5}$ are not experienced equally across New York City. Communities of color and low-income populations in New York City experience the worst health outcomes from air pollution.[14] High-poverty neighborhoods tend to have higher baseline rates of many health conditions, including those associated with air pollution—so people living in these neighborhoods are more likely to have existing health problems that are worsened by air pollution.[15]

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[12] NYC Environmental & Health Data Portal, *The Public Health Impacts of PM2.5 from Traffic Air Pollution*, https://a816-dohbesp.nyc.gov/IndicatorPublic/data-stories/traffic-and-air-pollution/ (last visited May 30, 2024).
[13] NYC Environmental & Health Data Portal, *Health Impacts of Air Pollution*, https://a816 dohbesp.nyc.gov/IndicatorPublic/data-explorer/health-impacts-of-air pollution/?id=2124#display=summary (last visited May 30, 2024).
[14] New York City Dep't of Health, *Efforts to reduce air pollution should focus on neighborhoods with the worst health impacts*, Env't & Health Data Portal (2022), https://a816-dohbesp.nyc.gov/IndicatorPublic/data-stories/hia/.
[15] *Id.*

15. Children face greater exposure to HAPs due to their higher respiratory and soil/dust ingestion rates.[16]

16. And, as of 2014, the prevalence of elevated blood total mercury levels is significantly higher in adult Asian populations in New York City at 23.7%, compared to 12.1% of all New York City adults due to the higher consumption of fish by that population.[17]

V. COAL- AND OIL-FIRED POWER PLANT EMISSIONS ARE A SIGNIFICANT CONTRIBUTOR TO AIR POLLUTION IMPACTING PUBLIC HEALTH IN NEW YORK CITY

17. Coal and oil-fired power plants contribute significantly to the presence of mercury and $PM_{2.5}$ in New York City.

18. Mercury can travel hundreds of miles from coal-fired power plants,[18] and a significant portion of Northeast mercury deposition originates from inadequately controlled coal-fired power plants located in other states.[19]

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[16] 76 Fed. Reg. at 25,018.
[17] New York City Department of Health, NYC Health and Nutrition Examination Survey, https://a816-health.nyc.gov/hdi/epiquery/visualizations?PageType=ps&PopulationSource=HANES; *see also* Wendy McKelvey et al., *A Biomonitoring Study of Lead, Cadmium, and Mercury in the Blood of New York City Adults*, 115(10) Env't Health Persp. 1435, 1439–40 & tbl.3 (2007), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2022653/ (Asian participants had significantly higher blood-mercury levels and reported significantly higher fish consumption than other ethnic groups surveyed).
[18] 77 Fed. Reg. at 9444.
[19] *See* Barbara Morin & Paul J. Miller, *Northeast States for Coordinated Air Use Mgmt. ("NESCAUM"), It Remains "Appropriate and Necessary" to Regulate*

19. Mercury emitted by power plants falls back to the earth, where microorganisms convert it to methylmercury, a potent neurotoxin.[20] Methylmercury moves up the food chain in marine and freshwater ecosystems.[21] Mercury-contaminated fish are bought and sold in interstate commerce, and individuals who consume store-bought fish thus suffer the downstream effects of power plant emissions.

20. In addition, between 20% and 30% of the $PM_{2.5}$ in New York City's air comes from sources in areas upwind from the City, including out-of-state coal-burning power plants,[22] and that portion of the City's $PM_{2.5}$ load is estimated to contribute to approximately 600 deaths and 1,500 hospital visits and hospitalizations each year.[23]

Toxic Air Emissions from Coal- and Oil-fired Electric Generating Units 7 (Apr. 7, 2022), https://www.nescaum.org/documents/nescaum-it-remains-approp-necess-reg-air-toxics-from-coal-oil-egus-20190417-final.pdf.

[20] *See* Philippe Grandjean et al., *Adverse Effects of Methylmercury: Environmental Health Research Implications*, 118(8) Env't Health Persp. 1137, 1140–41 (2010), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2920086/pdf/ehp-0901757.pdf.

[21] MacIntosh, *supra* note 1, at 16.

[22] New York City Dep't of Health, *The New York City Community Air Survey*, https://a816-dohbesp.nyc.gov/IndicatorPublic/data-features/nyccas/ (last visited May 30, 2024).

[23] *See* Masha Pitiranggon, et al., *Long-term trends in local and transported PM2.5 pollution in New York City*, 248 Atmospheric Environment, 118238 at 5 (2021) (finding that 23-30 percent of $PM_{2.5}$ in NYC in 2017 was attributable to regional sources and that sulfate was the largest component of that $PM_{2.5}$); Steffania Squizzato, et al., *A long-term source apportionment of $PM_{2.5}$ in New York State during 2005–2016*, 192 Atmospheric Environment 35, 38-39 (2018) (finding that

21. Thus, by limiting HAP emissions from coal- and oil-fired power plants, MATS has for years reduced New Yorkers' exposure to mercury, other hazardous metals, and $PM_{2.5}$. The Final Rule, particularly by making more stringent the filterable particulate matter surrogate emissions standard for hazardous non-mercury metals, will further reduce New Yorkers' exposure to those HAPs and $PM_{2.5}$. And, accordingly, health impacts, including hospitalizations and premature mortality associated with HAPs and $PM_{2.5}$, will decrease as a result of the Final Rule.

I declare under penalty of perjury that the foregoing is true and correct. Executed in Hicksville, New York on June 6, 2024.

Sarah Johnson

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the sulfate fraction of $PM_{2.5}$ in New York is highly correlated with variations in selenium which supports its association with coal-fired power plants); New York City Dep't of Health, *Health Impacts of Air Pollution: Asthma Emergency Departments Visits due to Ozone*, Env't & Health Data Portal (2017) (showing a total of 5191 annual hospital visits and hospitalizations and a total of 1971 annual deaths attributable to PM2.5 exposure), https://a816-dohbesp.nyc.gov/IndicatorPublic/beta/data-explorer/health-impacts-of-air-pollution/; Vincent Dutkiewicz, et al., *Elemental composition of PM2.5 aerosols in Queens, New York: Evaluation of sources of fine particle mass*, 40 Atmospheric Environment 347, 351, 355, 357-58 (2006) (finding selenium to be associated with transported coal emissions in northeastern U.S.).

ORAL ARGUMENT NOT YET SCHEDULED

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

STATE OF NORTH DAKOTA, et al., Petitioners, v. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, Respondent.	Case No. 24-1119 (and consolidated cases)

DECLARATION OF RAO KONIDENA

I, Rao Konidena, pursuant to 28 U.S.C § 1746, state and declare as follows:

QUALIFICATIONS

1. I am the President and Chief Executive Officer at Rakon Energy LLC, a consulting firm that focuses on providing policy and testimony support, business development, and training in wholesale energy markets.

2. I regularly provide testimony to public utilities commissions around the country on energy storage, distributed energy resources, tariffs, utility rates, energy transmission, and energy infrastructure.

3. I am a co-author of Modern Electricity Systems: Engineering, Operations, and Policy to address Human and Environmental Needs (2022), a graduate-level textbook.

4. I have authored multiple publications in Electricity Journal, Renewable Energy World, and other peer-reviewed industry journals.

5. I also serve on the Board of Ever Green Energy and the Center for Renewables Integration, and as a member of the Advisory Council for New York University School of Law's State Impact Center, a non-partisan and independent academic center dedicated to working towards a healthy and safe environment, guided by inclusive and equitable principles.

6. Prior to consulting, I was Principal Advisor for Policy Studies for the Midcontinent Independent System Operator (MISO), where I worked on energy storage and distributed energy resources.

7. I have nearly two decades of experience in manufacturing, consulting, and grid operator environments. I have worked in several roles in core transmission planning areas of resource adequacy, economic planning, business management, and policy functions.

8. I have a BE in Electrical & Electronics Engineering from Bangalore University and a MS in Electrical Engineering from University of

Texas at Arlington with a thesis on economic analysis of photovoltaics and fuel cells. I also have an MBA from Carlson School of Management at the University of Minnesota, with minor in International Business.

9. I submit this declaration in my own capacity and in support of the intervenor-respondent state and local governments' opposition to the motions to stay the Environmental Protection Agency's (EPA) final rulemaking action entitled *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*, 89 Fed. Reg. 38, 508 (May 7, 2024) (MATS RTR), which strengthens the Mercury and Air Toxics Standards (MATS), 77 Fed. Reg. 9304 (Feb. 16, 2012).

10. Unless otherwise noted, the statements made in this declaration are based on my personal experience and expertise, and my review of various publicly available records, reports, statements, and data compilations prepared by MISO and other public agencies.

PURPOSE OF THIS DECLARATION

11. I understand that movants for a stay of the MATS RTR allege that if electric generating units—in particular, lignite-coal-fired units in

North Dakota—are subject to the MATS RTR while movants' challenge to that rule is pending in the courts, some generating units could face economic losses related to compliance with the rule that, in turn, could cause their owners to permanently shut down those units, and that such closures could lead to severe reliability impacts and electric system failure, including blackouts, within MISO.[1]

12. Without crediting any particular prediction about the closure of one or more generating units, I offer the following observations about MISO's operation, capacity- and transmission-planning, and approach to generating unit retirements to illustrate why I do not believe that the closure of one or more generating units—should such closure(s) come to pass in the first place—would cause blackouts or other serious adverse reliability impacts within the MISO region.

THE ROLE OF MISO IN PROVIDING RELIABLE ELECTRICITY TO THE MIDWEST AND SOUTHERN U.S.

13. A regional transmission organization (RTO), such as MISO, is an independent, non-profit, membership-based organization responsible for

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[1] *See e.g.*, Vigesaa Decl. ¶¶ 22-25 (Ex. 1 to State of North Dakota et al. Mot. for Stay, ECF No. 205870 ("States Mot.")); Fedorchak Decl. ¶ 15-16, 19, 24, 37 (Ex. 2 to States Mot.).

optimizing generation and transmission of electricity and ensuring the reliability of the electric power system within its region. MISO supplies power to 45 million people in its region, which includes portions of 15 states in the Midwest and the South, extending from Michigan and Indiana west to Montana and North Dakota and from the Canadian border south to Louisiana and Mississippi.[2] This means MISO can, in effect, instantaneously, provide power—in the form of electrons—all the way from Manitoba Province in Canada to the southern U.S. through its transmission system.

14. At base, MISO manages the generation and transmission of electricity across high-voltage lines to ensure that the right amount of electricity is generated and transmitted to member utilities within the MISO region. Those utilities are then responsible for delivering the power to their residential, commercial, and industrial customers. Although MISO does not own individual transmission lines or generating units, as an RTO regulated by the Federal Energy Regulatory Commission (FERC) it is responsible for managing the transmission lines in an open, non-discriminatory, and

[2] MISO, *Fact Sheet* (July 2024), https://www.misoenergy.org/meet-miso/media-center/2024/corporate-fact-sheet/ (visited July 19, 2024).

transparent manner and for providing unbiased regional grid management to all customers in the region.[3]

15. To do so, MISO administers bulk or wholesale power markets that centrally commit and dispatch power to facilitate least-cost and reliable power production and delivery throughout the region.[4] The wholesale markets within MISO signal and value power needs and identify the most economically efficient way—the least-cost approach where demand for energy equals the cost supplied—to meet them across the system.

16. MISO is part of the Eastern Interconnection power grid, one of three major power grids in the continental U.S., which extends from the eastern edge of the Rockies to the Atlantic seaboard, including central Canada, but not Québec, and south to Florida.[5] Because MISO's markets cover only a portion of the power grid, to reliably operate those markets,

[3] *See* 18 C.F.R. § 35.34(a), (j)(1); MISO, *Electric Grid 101*, https://www.misoenergy.org/meet-miso/grid-operations-basics/ (visited July 19, 2024).

[4] *See* MISO, *Energy Markets 101*, https://www.misoenergy.org/meet-miso/market-basics/ (visited July 19, 2024).

[5] *See* U.S. Department of Energy ("DOE"), Office of Electricity, *Learn More About Interconnections*, https://www.energy.gov/oe/learn-more-about-interconnections#:~:text=North%20America%20is%20comprised%20of,(excluding%20most%20of%20Texas) (visited July 19, 2024).

MISO also works to coordinate generation and transmission of electricity with other RTOs within the Eastern Interconnection power grid across the "seams," or interconnected bulk and transmission system boundaries, between different RTOs.[6] Thus, under normal operating conditions, MISO imports power from PJM (Pennsylvania-New Jersey-Maryland) RTO to the east using interregional transmission lines/infrastructure. It has similar interconnections with the SPP (Southwest Power Pool) to the west.

17. In addition, MISO plays a key role in electric resource (or generation capacity) planning within the region to ensure there is sufficient generation, served by adequate transmission, to deliver reliable, affordable, and sustainable electricity.[7]

18. As described in more detail in the next section, MISO uses advanced modeling and thorough research to coordinate short and long-term planning for the benefit of generating units and consumers.[8]

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[6] *See*, MISO, *Interregional Coordination*, https://www.misoenergy.org/planning/interregional-coodination/ (visited July 19, 2024).
[7] MISO, *Transmission and Generation Planning 101*, https://www.misoenergy.org/meet-miso/grid_planning_basics/ (visited July 19, 2024).
[8] *Id*.

Nationally, other FERC-jurisdictional RTOs, such as PJM and SPP, operate similarly to MISO and follow comparable planning approaches and standards to ensure reliability within their regions.

MISO HAS MANY MEASURES IN PLACE TO PREVENT THE CLOSURE OF GENERATING UNITS FROM ADVERSELY AFFECTING ELECTRIC GRID RELIABILITY WITHIN THE REGION.

19. The MISO region has approximately 150,000 MW of installed generation capacity[9] and nearly 3,000 generating units.[10] This substantial installed capacity and number of generating units alone helps ensure reliability within MISO, such that the loss of individual generators—due to implementation of the MATS RTR or for any other reason—will not impact overall MISO system reliability.

20. Further, MISO controls an extensive transmission system—consisting of 75,000 miles of transmission lines across 15 U.S. states and the province of Manitoba.[11] Given MISO's transmission lines and

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[9] MISO, PLANNING YEAR 2024-2025 LOSS OF LOAD EXPECTATION STUDY REPORT (Apr. 2024) ("LOLE REPORT") at 35, tbl. 4-1, https://cdn.misoenergy.org/LOLE%20Study%20Report%20PY%202024-2025631112.pdf. This installed capacity number, which is for summer 2024, represents the most current assessment of the MISO region's capacity.
[10] *Fact Sheet*, *supra* note 2 (reflecting number of generating units as of December 2023).
[11] *Id.*

interconnections, MISO is able to call upon generating units from other MISO states and deliver that generation capacity over the interconnected high voltage transmission lines. On a normal basis, MISO also imports power from the neighboring PJM and exports to SPP region and can further call on that neighboring generating capacity during emergency situations, if needed[12]. These transmission interconnections thus also ensure system reliability in the MISO region, and other regions, regardless of the cause. For example, during Winter Storm Elliott in December 2022, which brought extreme cold to the Eastern Interconnection region, MISO exported power to neighboring regions to assist them in meeting power demands in those regions.[13]

21. Indeed, the loss of some generating units and transmission lines is not uncommon during real-time market operations. That does not lead to load shedding, i.e., brownouts or blackouts. That is in part because MISO

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[12] *See* MISO, *Historical Net Scheduled Interchange (NSI)*, at https://www.misoenergy.org/markets-and-operations/real-time--market-data/market-reports/ (data found under "Summary" Market Reports) (visited July 21, 2024).

[13] *See* MISO, *Overview of Winter Storm Elliott December 23, Maximum Generation Event* (Jan. 17, 2023) ("*Winter Storm Elliott Overview*") at 7, https://cdn.misoenergy.org/20230117%20RSC%20Item%2005%20Winter%20Storm%20Elliott%20Preliminary%20Report627535.pdf.

runs an optimization engine in the MISO control room that is constantly simulating the loss of generating units and transmission lines in order to be prepared for such inevitable events. These kinds of short-term capacity or transmission outages may be due to weather events, which may disrupt transmission lines or local, utility distribution lines or damage components at generating units, and other operational issues, such as an inability to obtain adequate fuel for a particular generating unit.

22. Thus, during Winter Storm Elliott, MISO was able to manage severe constraints in some of its transmission lines by declaring local transmission emergencies and to thereby avoid disruptions in electricity delivery to customers in the immediate local area.[14] It was also able to rely on increased capacity from renewable wind energy during the storm event to compensate for increased heating demands.[15] MISO also engages in comprehensive, after-the-fact analysis of such events in order to refine and improve its response during future events, and indeed cites lessons learned from Winter Storm Uri in 2021 as a key factor in its successful operations

[14] *See id.* at 8.
[15] *Id.*

during Elliott.[16] This iterative approach is particularly important in current times given the increased frequency of extreme weather conditions for which there is limited or no historical data.[17]

23. As noted above, MISO also continually engages in extensive longer term planning to ensure the availability of generation capacity and transmission infrastructure sufficient to provide reliable, affordable, and sustainable delivery of electricity. In particular, MISO works with the Organization of MISO States (OMS), which represents "the collective interests of state and local utility regulators"[18] each year to complete a comprehensive capacity survey to understand the estimated capacity of each state's available generators, that is, the maximum electricity output those generating units can physically produce.[19]

24. Further, MISO conducts summer and winter assessments to understand the risk of meeting forecasted demand in the upcoming seasons

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[16] *See id.* at 4, 11.
[17] *See id.* at 9, 13.
[18] OMS, *The Power of Working Together*, https://www.misostates.org/ (visited July 21, 2024).
[19] *See, e.g., OMS & MISO, 2024 OMS-MISO Survey Results* (June 20, 2024), https://cdn.misoenergy.org/20240620%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation635585.pdf.

in light of the region's estimated capacity for that time period.[20] In determining the available capacity, MISO considers, among other things, expected summer or winter weather conditions as well as projected transmission and generation availabilities, including planned generator retirements as well as new sources of capacity expected to come online during that time period.

25. As an RTO, MISO's decision making authority is limited to the transmission of power generated within the individual states in the region. It does not control generation planning decisions or resource procurement, i.e., the number and type of generating units present in individual states. Thus, MISO relies on input from states and utilities within each MISO state

[20] *See, e.g.*, MISO, *MISO projects sufficient resources for summer season, but risks continue to mount* (Mar. 21, 2024), https://www.misoenergy.org/meet-miso/media-center/2024/miso-projects-sufficient-resources-for-summer-season-but-risks-continue-to-mount/#:~:text=%E2%80%94%20Today%2C%20MISO%20will%20outline%20its%202024%20summer,143%20GW%20of%20projected%20available%20generation%20within%20MISO; MISO, *MISO provides outlook for the winter season* (Oct. 21, 2023), https://www.misoenergy.org/meet-miso/media-center/2023/miso-provides-outlook-for-the-winter-season/#:~:text=The%20weather%20forecast%20is%20trending%20warmer%20this%20year%2C,on%20the%20new%20seasonal%20Planning%20Resource%20Auction%20results.

for evaluating these supply and demand issues, such as through the annual OMS capacity survey.

26. Many states, including North Dakota, also require their utilities to submit to their public utility commissions "integrated resource plans," which forecast energy demand and supply within their service areas in order to ensure that demand will be reliably met.[21] This is another planning process—conducted at the state level—intended to evaluate and plan around generator retirements in order to prevent reliability issues. Such plans usually cover a 20-year planning horizon and include a detailed implementation plan for the first few years with a required update every two to three years.[22]

27. In addition to these regular assessments of electric resource or generation capacity, MISO annually completes a transmission expansion

[21] *See* N.D.C.C. § 49-05-05.4.
[22] *See* MI Pub. Serv. Comm'n, *IRP Requirements for MISO States* (Mar. 2017), https://www.michigan.gov/-/media/Project/Websites/mpsc/workgroups/irp/IRP_Requirements_for_MISO_States.pdf?rev=b2e1410e61394c0386cf5bcb24dc6ced (visited July 21, 2024).

planning report, the MISO Transmission Expansion Plan,[23] which identifies the "ready-to-build" transmission construction and maintenance projects approved that year by MISO's independent Board of Directors.[24] Approved projects address local reliability issues, load (i.e., electricity demand) growth, and interconnection needs, among other things, and are expected to be in-service within 3-5 years.[25] MISO addresses longer term projects involving larger regional transmission issues through a separate Long Range Transmission Planning process.[26]

28. Further, if an asset owner wants to retire a generating unit, it must give one year advance notice to MISO, and, upon receiving that notice, MISO runs a generator retirement study to determine if there are any transmission reliability issues with that particular generating unit

[23] *See, e.g.*, MISO, TRANSMISSION EXPANSION PLAN 2023 REPORT (2023) ("MTEP23 REPORT"), https://cdn.misoenergy.org/MTEP23%20Full%20Report630587.pdf.
[24] MISO, *Transmission Expansion Plan (MTEP)*, https://www.misoenergy.org/planning/transmission-planning/mtep/#t=10&p=0&s=&sd= (visited July 19, 2024).
[25] *Id.*
[26] MISO, *Long Range Transmission Planning*, https://www.misoenergy.org/planning/long-range-transmission-planning/ (visited July 19, 2024).

retirement.[27] This is called an "Attachment Y process." If MISO finds the proposed retirement could lead to transmission reliability issues, then MISO can designate that particular generating unit as a "System Support Resource" and pay the generator to keep that unit online while it waits for transmission owners to make necessary transmission improvements to address the identified reliability issues. That designation requires the development of an annual MISO System Support Resource contract, that FERC must approve. This overall process is designed to manage generator retirement decisions so as to avoid the risk of service interruptions, such as blackouts. One recent example in MISO involves Ameren Missouri's Rush Island Plant, for which FERC has approved a System Support Resource Contract to keep its generating units online until reliability issues can be

[27] *See* MTEP23 REPORT, *supra* note 23, at 34; MISO, BUSINESS PRACTICE MANUAL: TRANSMISSION PLANNING, BPM-020-R30 (eff. Dec. 1, 2023) at 151, https://www.misoenergy.org/legal/rules-manuals-and-agreements/business-practice-manuals/ (requiring advance notice of "four quarterly study periods").

addressed.[28] A similar situation recently occurred in the PJM region in relation to the Brandon Shores and Wagner generators.[29]

29. Finally, MISO, like all RTOs, takes short-term measures under its emergency operating procedures in order to avoid "load shed" that will cause service interruptions when a local operational event—such as a severe storm—causes a real-time, adverse impact to system reliability. These procedures include a series of advisories, alerts, warnings, and events (in order of seriousness) designed communicate the need to address limited operating capacity and implement protective measures by increasing generating capacity, such as by suspending maintenance on generating units within the affected area or requiring other RTOs to make capacity from their

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[28] *See* Ethan Howland, *FERC approves MISO reliability contract to keep Ameren Missouri's Rush Island coal plant operating*, UTILITY DIVE (Oct. 26, 2022), https://www.utilitydive.com/news/ameren-rush-island-ferc-miso-reliability-ssr-contract/634977/ (visited July 19, 2024); *see also* Letter from Jeffrey L. Small, MISO Senior Corp. Counsel to Hon. Stephanie D. Bose, Secretary of FERC, dated Aug. 18, 2022, https://cdn.misoenergy.org/2022-08-19_Docket%20No.%20ER22-2691-000_Public626063.pdf (seeking approval of Rush Island SSR Agreement).

[29] *See* PJM, *BESS Technical Viability – Wagner and Brandon Shores Retirements* (May 3, 2024) https://pjm.com/-/media/library/reports-notices/special-reports/2024/20240503-bess-technical-viability-wagner-and-brandon-shores-retirements-study.ashx; *see also* Lane Decl. ¶ 26 (Ex. 3 to States Mot.) (discussing retirement of the Brandon Shores and Wagner generating units).

regions available, and/or by reducing demand or load, such as through deployment of demand management programs.[30] A "demand response" approach is one type of demand management measure available to MISO, through which MISO can pay customers to reduce their electricity use during times of emergency to allow power to be sent to areas with emergency need.[31]

30. All these measures seek to avoid the need to reduce the flow of power—through load shed, the last event in the checklist—to consumers where the local event has occurred. Notably, during Winter Storm Elliott, MISO successfully deployed many of these emergency operating procedures to avoid any disruption of power to consumers despite the extremely low temperatures, high heating demands, and unplanned generation outages due to reduced gas supply availability and the failure of generating units to perform during the low temperatures.[32] At the same time, MISO was able to continue to export capacity to assist neighboring regions.

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[30] *See* MISO, *Operating Procedures* (Oct. 25, 2022), https://cdn.misoenergy.org/Three%20Pager%20-%20MISO%20Operating%20Procedures%2010252022318965.pdf.
[31] *See* FERC, *Demand Response*, https://www.ferc.gov/power-sales-and-markets/demand-response (visited July 19, 2024).
[32] *See Winter Storm Elliott Overview*, *supra* note 13, at 5.

MISO HAS ALREADY MANAGED THE RETIREMENT OF SUBSTANTIAL GENERATION CAPACITY WITHOUT COMPROMISING SYSTEM RELIABILITY AND CAN DO THE SAME FOR ANY RETIREMENTS DUE TO THE MATS RTR.

31. Since 2010, MISO has experienced the retirement of 30.8 gigawatts (GW) of generation capacity, a large proportion of which (21.9 GW) was coal-fired generating units.[33] That trend is shown below in the bar graph (from MISO's 2023 Transmission Expansion Plan Report), which displays the retired capacity by generation type over time.

[33] MTEP23 REPORT, *supra* note 23, at 35, Fig. 2.2-1; *see also* MISO, *Approved Generator Retirements (Public) as of June 28, 2024* ("*Approved Retirements 2024*"), https://www.oasis.oati.com/woa/docs/MISO/MISOdocs/OASIS_Posting_of_Approved_Generator_Retirements_(Public)_2024-06-28.pdf (visited July 18, 2024). Also attached hereto as Exhibit 1.

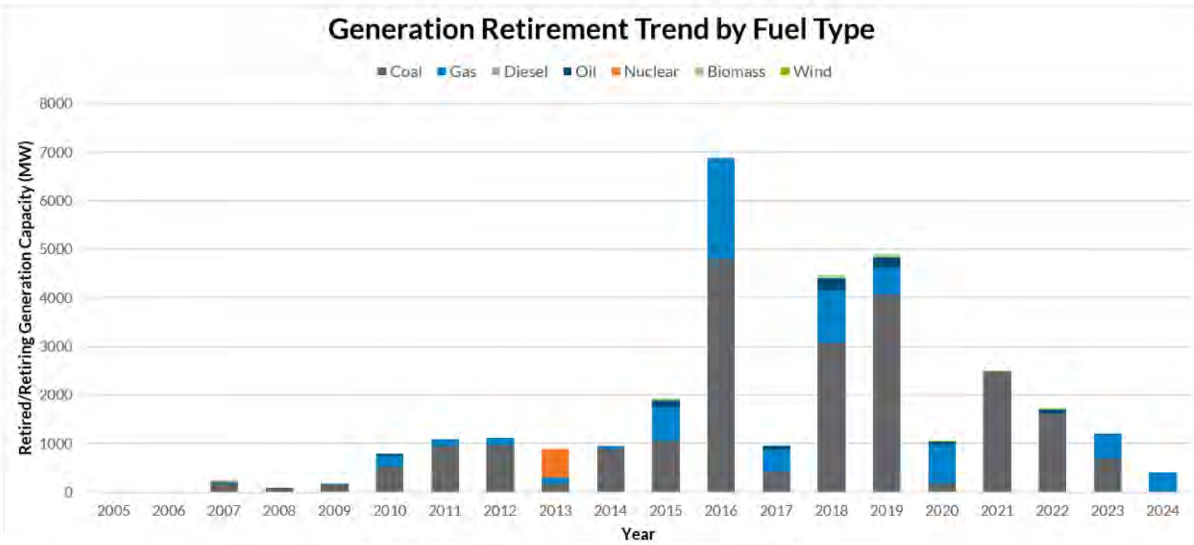

Figure 2.2-1: MW Generation Retirement by Fuel Type

Source: MISO, TRANSMISSION EXPANSION PLAN 2023 REPORT (2023) at 35, https://cdn.misoenergy.org/MTEP23%20Full% 20Report630587.pdf.

32. Through use of generation capacity and transmission infrastructure planning, the addition of new capacity—in particular renewables, and the implementation of the other measures discussed above, MISO has been able to absorb these retirements and maintain overall system reliability.[34] For example, between June 2020 and December 2023, when approximately 7 GW of coal and other "dispatchable" resources—those that can be turned on and off, independent of weather conditions—were retired,[35] the average number of power outages during both the winter and

[34] *See* MTEP23 REPORT, *supra* note 23, at 34-35.
[35] *See Approved Retirements 2024*, *supra* note 33.

summer seasons remained relatively constant, indicating that a sufficient buffer of such resources remained to contribute resiliency to the system.[36]

33. In addition, since 2018, 4 coal-fired power plants have retired capacity in the range of 1,000 MW in Wisconsin, Indiana, Illinois, and Michigan. *See* Table 1. None of these retirements resulted in service interruptions or other serious reliability problems within MISO, including in Michigan where, transmission is constrained due to geographic limitations caused by the Great Lakes.

Table 1. Large coal-fired generating units retired in MISO region since 2018.

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[36] In winter, the maximum seasonal peak for the total generation outages was 46.4 GW in 2023/24, and 44.4 GW in 2020/21, a difference of 2,000 MW, which is negligible in a system with approximately 150,000 MW of installed generation. *Compare* MISO, *Seasonal Assessment Generation* (Oct. 31, 2023) at 5, https://cdn.misoenergy.org/2023-24%20Winter%20Resource%20Assessment630640.pdf, *with* MISO, *2020-21 Winter Resource Assessment* at 3, https://cdn.misoenergy.org/2020-21%20Winter%20Resource%20Assessment492510.pdf. In summer, the peak was 24.2 GW in 2023 and 25.1 GW in 2020, again a negligible difference of approximately 1,000 MW. *Compare* MISO, *Seasonal Assessment – Generation Summer 2023* at 5, https://cdn.misoenergy.org/2023%20Summer%20Resource%20Assessment628978.pdf *with* MISO, *2020 Summer Resource Assessment* at 3, https://cdn.misoenergy.org/2020%20Summer%20Resource%20Assessment492509.pdf

Table 1. Large coal-fired generating units retired in MISO region since 2018.

Unit Description	Area	State	No of Units	Total MW	Fuel Type	Retirement Date
Pleasant Prairie 1 & 2	WEC (ATC)	WI	2	1188	Coal	4/10/2018
Coffeen Units 1 and 2	AMIL	IL	2	1101	Coal	11/1/2019
Schahfer Unit 14 & 15	NIPS	IN	2	1096.4	Coal	10/1/2021
St. Clair Unit 2,3,6 and 7	ITCT	MI	4	1100	Coal	12/31/2022

Source: MISO, *Approved Generator Retirements (Public) as of June 28, 2024*, https://www.oasis.oati.com/woa/docs/MISO/MISOdocs/OASIS_Posting_of_Approved_Generator_Retirements_(Public)_2024-06-28.pdf (visited July 18, 2024). Also attached hereto as Exhibit 1.

34. For further context, the 10 North Dakota lignite-coal-fired generating units that EPA anticipates will need to make upgrades to comply with the MATS RTR range from 92 to 574 MW in capacity.[37] The combined capacity of all of those units, 3,919 MW, represents 3 percent of MISO's current 150,187 MW of installed capacity and 18 percent of the current 22,031 MW of installed capacity for in local resource zone 1 (which includes North Dakota and Minnesota).[38] And, as discussed above, MISO is well-positioned to address any reliability implications in the unlikely event that all of those

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[37] These plants are: Leland Olds, Milton R. Young, Coal Creek, Antelope Valley, Coyote, and Spiritwood Station. *See* EPA, 2024 UPDATE TO THE 2023 PROPOSED TECHNOLOGY REVIEW FOR THE COAL- AND OIL-FIRED EGU SOURCE CATEGORY ("2024 TECHNICAL MEMO") (Jan. 2024), Attachment 1, Tab 2 ("Unit-Level Information and Inputs") (listing units by state) & Tab 4 ("0.010 Limit Assumptions") (listing assumed capacities for affected units), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-6919.

[38] *See* LOLE REPORT, *supra* note 9, at 35, tbl. 4-1 (showing summer 2024 installed capacity for MISO region), 38, tbl. 5-1 (showing summer 2024 installed capacity for local resource zone (LRZ) 1).

generating units chose to cease operations at the same time, including by delaying such retirements if necessary.

35. Finally, it should be noted that the capacity modeling that stay movants rely on to support their claim that closure of those North Dakota plants would cause significant reliability issues during times of peak electricity demand heavily discounts two kinds of generating capacity resources available to address such issues in real-time.[39] Specifically, the model assumes "imported" capacity resources from outside MISO (3,638 MW) and emergency capacity resources (7,875 MW)[40] that are significantly lower than those that MISO's independent market monitor[41] relies on, 8,595

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[39] *See* Vigesaa Decl., *supra* note 1, ¶ 24; N.D. Transmission Auth., ANALYSIS OF PROPOSED EPA MATS RESIDUAL RISK AND TECHNOLOGY REVIEW AND POTENTIAL EFFECTS ON GRID RELIABILITY IN NORTH DAKOTA (April 3, 2024) ("NDTA REPORT") at 51, https://www.ndic.nd.gov/sites/www/files/documents/Transmission-Authority/Publications/MATS_Analysis_Report.pdf.

[40] NDTA REPORT, *supra* note 39, at 51 ("Our model allows for the use of 7,875 MW of Load Modifying Resources (LMRs) and 3,638 MW external resources (imports) in determining how much reliable capacity will be needed within MISO to meet peak electricity demand under the new MATS rules.")

[41] The monitor is responsible for evaluating MISO's "competitive performance and efficiency of MISO's wholesale electricity markets." Potomac Economics, 2023 STATE OF THE MARKET REPORT FOR THE MISO ELECTRICITY MARKETS (June 2024) at i,

MW[42] and 12,668 MW,[43] respectively. Without accurately accounting for these kinds of capacity resources that are available during peak electric demand to satisfy load, it is unlikely that such a model can accurately predict the likelihood of potential capacity shortages during such periods.

CONCLUSION

36. MISO is well-equipped to understand and handle generating unit retirements. It does so regularly, and such retirements—including significant retirements of coal-fired and other fossil-fuel generating resources over the last decades—have not led to serious system service interruptions, like blackouts. The capacity provided by the lignite-coal-fired generating units that movants have identified as being at risk of retirement

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https://www.potomaceconomics.com/wp-content/uploads/2024/06/2023-MISO-SOM_Report_Body-Final.pdf.

[42] This number is the sum of MISO's firm imports (4,335 MW) and non-firm net imports in emergencies (4,260 MW) that the monitor uses to assess resource adequacy for peak summer loads. *See id.* at 70, tbl. 12. These values are conservative, according to the monitor, because "the import levels would likely rise to much higher levels in response to shortage pricing in MISO." *Id.* at 70.

[43] This number represents "load modifying resources," generating capacity resources that must be curtailed during emergency operations, as well as "demand response resources" and "emergency demand response" resources that are likely to act similarly during such situations. *See id.* at 91, 92 & tbl. 16, 93-94.

due to implementation of the MATS RTR are small relative to MISO's existing capacity and transmission resources. Further, MISO takes a comprehensive and careful approach to capacity and transmission planning, based on robust modeling and comprehensive research. It also has a variety of measures in place that it has repeatedly and successfully deployed to address the short- and long-term impacts of reductions in capacity, whether due to generator retirements or other causes. In my view, MISO will be able to plan for and address any adverse reliability impacts that the potential closure of one or more generating units—due to the MATS RTR or any other reason—would have within the MISO region.

I declare under penalty of perjury that the foregoing is true and correct.

Rao Konidena

Executed in Ramsey County, MN, on July, 22, 2024.

Exhibit 1

Generator Retirements

As of June 28, 2024

MISO Generators Approved to Retire (Public)

Disclaimer: This listing serves as public notice of generator retirements. This does not include generators on suspension. This information is being provided as-is, with no guarantee of the completeness or accuracy of the data.

Unit Description	Area	State	No of Units	Total MW	Fuel Type	Retirement Date
Kickapoo 1-8	AMIL	IL	8	12.8	Oil	12/1/2005
Blount 1	MGE (ATC)	WI	1	6.8	Coal	1/1/2006
West Faribault 2 and 3	XEL (NSP)	MN	2	31	Gas	1/1/2007
Presque Isle 1 & 2	WEC (ATC)	MI	2	62	Coal	1/1/2007
Hallock 1-8	AMIL	IL	8	12.8	Diesel	1/1/2007
Culley 1	SIGE	IN	1	46	Coal	1/1/2007
Tazewell Power Modules 1-14	AMIL	IL	14	25.6	Diesel	1/1/2007
Maquoketa 1	AMIL	IL	1	2.1	Diesel	6/7/2007
Hoot Lake 1	OTP	MN	1	7.5	Coal	10/22/2007
Pulliam 3	WPS (ATC)	WI	1	26	Coal	12/31/2007
Pulliam 4	WPS (ATC)	WI	1	29	Coal	12/31/2007
Miami Fort 5*	DEO&K	OH	1	80	Coal	1/29/2008
Oak Creek 9	WEC (ATC)	WI	1	18	Coal	9/1/2008
Sterling 1 & 2	AMIL	IL	2	42.4	Gas	1/2/2009
Presque Isle 3	WEC (ATC)	MI	1	58	Coal	10/1/2009
Presque Isle 4	WEC (ATC)	MI	1	58	Coal	10/1/2009
Lakeside 6 & 7	CWLP	IL	2	76	Coal	10/1/2009
Black Hawk 3 & 4	ALTE (ATC)	WI	2	54	Gas	4/1/2010
Rock River 1 & 2	ALTE (ATC)	WI	2	150	Gas	4/1/2010
Austin DTST 2, 3 & 4	SMMPA	MN	3	25.5	Coal	4/8/2010
Edgewater CTA & CTB*	FE	OH	2	52	Oil	10/1/2010
Gaylord 5	METC	MI	1	14	Gas	10/14/2010
Edwardsport 6, 7 & 8	DEI	IN	3	160	Coal & Oil	11/1/2010
Burger 4 & 5*	FE	OH	2	330	Coal	12/31/2010
Michigan City 2 & 3	NIPS	IN	2	120	Coal	3/15/2011
Mitchell 4, 5, 6 & 11	NIPS	IN	4	420	Coal	3/15/2011
Miami-Wabash CT4	DEI	IN	1	16	Oil	4/1/2011
Blount 3, 4 & 5	MGE (ATC)	WI	3	90.1	Coal	6/1/2011
6ththreet 2_A, 4, 7 & 8	ALTW (ITCM)	IA	4	55	Gas	6/1/2011
Conners Creek 15 & 16	METC	MI	2	270	Coal	6/1/2011
Lansing 3	ALTW (ITCM)	IA	1	35	Coal	7/22/2011
Venice CTG	AMMO	MO	1	25	Gas	9/1/2011
Viaduct CTG	AMMO	MO	1	25	Gas	9/1/2011
Lakefront 4	WPS (ATC)	WI	1	10	Coal	11/1/2011
8ththreet 2 (Dubuque)	ALTW (ITCM)	IA	1	15	Coal	12/31/2011
Vermilion 1, 2 & 3	AMIL	IL	3	171	Coal	1/13/2012
Gallagher 1 & 3	DEI	IN	2	280	Coal	1/31/2012
Wood River 1, 2 & 3	AMIL	IL	3	116.3	Coal	3/6/2012
Alma 1, 2 & 3	DPC	WI	3	60	Coal	6/1/2012
Pearl 1	AMIL	IL	1	22	Coal	6/1/2012
Havana 1-5	AMIL	IL	5	224	Coal	6/8/2012
Stallings 1, 2, 3, & 4	AMIL	IL	4	88	Gas	12/31/2012
Oglesby 1, 2, 3, & 4	AMIL	IL	4	63	Gas	12/31/2012
Conners Creek DG11	METC	MI	2	5	Diesel	3/1/2013
Dayton DG11	METC	MI	5	10	Diesel	3/1/2013
Kewaunee 1	WPS (ATC)	WI	1	570.1	Nuclear	5/7/2013
Austin DTCT	MMPA	MN	1	5	Gas	8/31/2013
Thetford 5, 6 & 7	METC	MI	3	51	Gas	9/14/2013
Thetford 8 & 9	METC	MI	2	34	Gas	9/14/2013

Unit Description	Area	State	No of Units	Total MW	Fuel Type	Retirement Date
Fair Station 1 & 2	ALTW (ITCM)	IA	2	64	Coal	9/30/2013
Mitchell 9	NIPS	IN	1	17	Gas	10/1/2013
Gaylord 4	METC	MI	1	17	Gas	11/1/2013
Harbor Beach 1	METC	MI	1	103	Coal	12/31/2013
Harbor Beach Peaker	METC	MI	1	4	Diesel	12/31/2013
Morrow A, B	METC	MI	1	22.5	Gas	3/13/2014
Independence 5, 6, 7, 1A, 3A, 3B, 4A & 4B	ALTW (ITCM)	IA	8	18.3	Diesel	6/1/2014
Alma 4	DPC	WI	1	50	Coal	9/8/2014
River Rouge 1	ITCT	MI	1	250	Coal	9/26/2014
Hutsonville 3 & 4	AMIL	IL	2	152.6	Coal	10/25/2014
Alma 5	DPC	WI	1	75	Coal	10/27/2014
Meredosia 1, 2 & 3	AMIL	IL	3	363	Coal	11/30/2014
Howard Bend 1	AMMO	MO	1	50	Oil	1/31/2015
Ratts 1 & 2	HE (Vectran)	IN	2	250	Coal	2/4/2015
Walter Scott 1 & 2	MEC	IA	2	131	Coal	3/31/2015
Key City 1-4	XEL (NSP)	MN	4	72	Oil	3/31/2015
Trenton Channel 8	METC	MI	1	100	Coal	4/1/2015
White Pine 2	WEC (ATC)	MI	1	20	Gas	4/15/2015
Cobb 1, 2 & 3	METC	MI	3	183	Gas	5/31/2015
Thetford 1	METC	MI	1	37	Gas	5/31/2015
Whiting A	METC	MI	1	17	Gas	5/31/2015
Weadock A	METC	MI	1	17	Gas	5/31/2015
Morgan City 3 & 4	LEPA	LA	2	58	Gas	5/31/2015
Plaquemine 1 & 2	LEPA	LA	2	44	Gas	5/31/2015
Pulliam 5 & 6	WPS (ATC)	WI	2	115	Coal	6/1/2015
Weston 1	WPS (ATC)	WI	1	60	Coal	6/1/2015
Little Gypsy 1	EES	LA	1	227.9	Gas	6/1/2015
Escanaba 1 & 2	UPPC (ATC)	MI	2	25	Coal	6/15/2015
Hunter 4	CLEC	LA	1	80	Coal	9/1/2015
Stoneman 1 & 2	DPC	WI	2	52	Biomass	11/2/2015
Nelson Dewey 1 & 2	ALTE (ATC)	WI	2	220	Coal	12/31/2015
Edgewater 3	ALTE (ATC)	WI	1	71	Coal	12/31/2015
Silver Lake 1, 2, 3 & 4	MMPA	MN	4	99	Gas	12/31/2015
Edwards 1	AMIL	IL	1	103.1	Coal	1/1/2016
Meredosia 4	AMIL	IL	1	186	Coal	1/12/2016
D.G. Hunter ST3	CLEC	LA	1	58.64	Gas	3/21/2016
Neal 1 & 2	MEC	IA	2	496	Coal	4/15/2016
Cobb 4 & 5	METC	MI	2	320	Coal	4/15/2016
Weadock 7 & 8	METC	MI	2	310	Coal	4/15/2016
Whiting 1, 2 & 3	METC	MI	3	328	Coal	4/15/2016
Wabash River 2-5	DEI	IN	4	435	Coal	4/16/2016
Eagle Valley 3, 4, 5 & 6 (at Pritichard station)	IPL	IN	4	302	Coal	4/16/2016
Trenton Channel 7	METC	MI	1	110	Coal	4/16/2016
CWLD Plant D Gen 5	CWLD	MO	1	16.5	Coal	4/30/2016
Cooper - Grand Forks	OTP	ND	1	4.9	Diesel	5/31/2016
Michoud 2	EES	LA	1	261.8	Gas	6/1/2016
Ninemile Point 3	EES	LA	1	169.8	Gas	6/1/2016
Michoud 3	EES	LA	1	541.9	Gas	6/1/2016
Endicott Generating Station	METC	MI	1	60	Coal	6/1/2016
Mabelvale	EES	AR	2	28	Gas	6/1/2016
Willow Glen 2 & 4	EES	LA	2	661.9	Gas	6/1/2016
Wabash River 1 (ST)	DEI	IN	1	84.5	Coal	6/1/2016
Austin North East	SMP	MN	1	30	Coal	6/1/2016
Wood River 4 & 5	AMIL	IL	2	473.23	Coal	6/1/2016
Escanaba CT	UPPC (ATC)	MI	1	13.13	Gas	6/1/2016
Sabine 2	EES	TX	1	213	Gas	6/1/2016
River Rouge 2	METC	MI	1	260	Coal	6/30/2016

Unit Description	Area	State	No of Units	Total MW	Fuel Type	Retirement Date
Pontiac North	ITCT	MI	1	19	Coal	8/12/2016
Coleman 1,2,3	BREC	KY	3	443	Coal	9/1/2016
Newton 2	AMIL	IL	1	615	Coal	9/15/2016
Dow GT300	EES	LA	1	119	Gas	11/11/2016
White Pine 1	WEC (ATC)	MI	1	20	Gas	11/27/2016
Wabash River 6	DEI	IN	1	318	Coal	12/7/2016
Teche Power Station Unit 1	CLEC	LA	1	20	Gas	1/1/2017
Juneau County 31	WPS (ATC)	WI	1	18	Oil	3/1/2017
Bonin 2 & 3	LAFA	LA	2	171	Gas	4/1/2017
Stanton 1	GRE	MN	1	188	Coal	5/1/2017
8thtreet 3 & 4 (Dubuque)	ALTW (ITCM)	IA	3	69	Coal	6/1/2017
Sutherland 3	ALTW (ITCM)	IA	1	79.5	Gas	6/1/2017
Sutherland Steam 1	ALTW (ITCM)	IA	1	28.4	Gas	6/22/2017
Grinnell 1 & 2	ALTW (ITCM)	IA	2	47.1	Gas	8/31/2017
Paulding Gen	SMEPA	MS	1	20	Oil	8/31/2017
Fox Lake Unit 1 and 3	ALTW (ITCM)	MN	2	91.2	Gas	11/1/2017
North Centerville CT 1 and 2	ALTW (ITCM)	IA	2	46.5	Oil	11/1/2017
St. Clair Unit 4	ITCT	MI	1	158	Coal	11/13/2017
Flambeau CT	XEL (NSP)	WI	1	16	Gas	12/31/2017
Kirksville CTG	AMMO	MO	1	14	Gas	1/1/2018
Black Dog 3 & 4	XEL (NSP)	MN	2	255	Coal	2/15/2018
Broadway Avenue – BAGS Unit 1	SIGE	IN	1	53	Gas	2/15/2018
Pleasant Prairie 1 & 2	WEC (ATC)	WI	2	1188	Coal	4/10/2018
Bailly 7 & 8	NIPS	IN	2	480	Coal	5/31/2018
Henderson Station	EES-EMI	MS	4	56.5	Coal	5/31/2018
Connersville CT 1 & 2	DEI	IN	2	92	Oil	6/1/2018
Miami Wabash 1,2,3,5,6	DEI	IN	5	85	Oil	6/1/2018
Red Cedar Generating Station	ALTW (ITCM)	IA	1	13.1	Gas	6/1/2018
Wheaton Unit 5	XEL (NSP)	WI	1	70	Gas & Oil	6/1/2018
Baxter Wilson 2	EES-EMI	MS	1	677.9	Gas & Oil	6/1/2018
Kapp Unit 2	ALTW (ITCM)	IA	1	106.5	Coal	6/1/2018
Rex Brown Plant Unit 3	EES-EMI	MS	1	23.5	Gas	6/1/2018
Taconite Harbor Unit 3	MP	MN	1	75	Coal	6/1/2018
Benndale	SMEPA	MS	1	16	Gas	8/29/2018
Kapp Unit 2	ALTW (ITCM)	IA	1	112	Gas	9/6/2018
Edgewater Unit 4	ALTE (ATC)	WI	1	309.2	Coal	9/30/2018
Pulliam Units 7 and 8	WPS (ATC)	WI	2	210	Coal	10/31/2018
Buras Plant Unit 8	EES	LA	1	11	Gas & Oil	10/31/2018
Hastings Unit 1	GRE	MN	1	8.8	Oil	11/2/2018
Lake Marion Unit 1	GRE	MN	1	8.8	Oil	11/2/2018
FibroMinn	OTP	MN	1	62	Biomass	11/13/2018
Morrow Units 1 and 2	SMEPA	MS	2	400	Coal	11/17/2018
Straits Unit 1	METC	MI	1	21	Gas	11/30/2018
Campbell Unit A	METC	MI	1	12	Gas	11/30/2018
Gaylord Units 1, 2 and 3	METC	MI	3	50	Gas	11/30/2018
Sterlington 7B	EES	LA	1	65	Gas	1/1/2019
Henderson Municipal Power & Light Units 1&2	BREC	KY	2	312	Coal	2/1/2019
St. Clair Unit 1	ITCT	MI	1	158	Coal	3/27/2019
Presque Isle 5,6,7,8,9	MIUP (ATC)	MI	5	359	Coal	3/31/2019
Northeast - NET Units 1 & 2	SIGE	IN	1	22.5	Gas	5/5/2019
Granite City Units 1,2,3,4	XEL (NSP)	MN	4	72	Gas & Oil	6/1/2019
Bay Front Unit 4	XEL (NSP)	WI	1	22.6	Biomass	6/1/2019
Rex Brown 4 & 5	EES-EMI	MS	2	209.2	Gas	6/11/2019
Reid Unit1	BREC	KY	1	50	Coal	6/24/2019
Thetford 2	METC	MI	1	37	Gas	6/26/2019
Burnips 6	METC	MI	1	23	Gas	7/29/2019
Woodville Renewable Power Project	EES	TX	1	45.5	Biomass	8/12/2019

Unit Description	Area	State	No of Units	Total MW	Fuel Type	Retirement Date
Baldwin 3	AMIL	IL	1	650	Coal	9/4/2019
Coffeen Units 1 and 2	AMIL	IL	2	1101	Coal	11/1/2019
Hennepin Units 1 and 2	AMIL	IL	3	366	Coal	11/1/2019
Havana Unit 6	AMIL	IL	1	543	Coal	11/1/2019
Plant D7	CWLD	MO	1	22	Coal	12/6/2019
Duck Creek Unit 1	AMIL	IL	1	517	Coal	12/15/2019
Hancock Unit 11-2	ITCT	MI	1	24	Gas	12/22/2019
Hancock Unit 11-4	ITCT	MI	1	22	Gas	12/22/2019
Broadway Avenue - BAGS Unit 2	SIGE	IN	1	88.8	Gas	12/22/2019
River Rouge Unit 3	ITCT	MI	1	170	Coal	6/1/2020
Nelson 4	EES	LA	1	424.7	Gas	6/1/2020
Sterlington Unit 7C	EES	LA	1	20	Gas	6/1/2020
Rock River 6	ALTE (ATC)	WI	1	34.3	Gas	6/1/2020
Sheepskin 1	ALTE (ATC)	WI	1	27.9	Gas	6/1/2020
White Pine 3	MIUP (ATC)	MI	1	20	Coal	6/1/2020
Rock River 3 & 5	ALTE (ATC)	WI	2	67.9	Gas	6/1/2020
Rock River 4	ALTE (ATC)	WI	1	14.4	Gas	6/1/2020
Bailly Unit 10	NIPS	IN	1	33	Gas	7/15/2020
Sabine Cogen	EES	TX	3	52.8	Gas	7/31/2020
Meramec CTG 1	AMMO	MO	1	70	Oil	12/29/2020
Community Wind North (G586)	XEL (NSP)	MN	1	3.6	Wind	12/31/2020
Jeffers Wind (G442)	XEL (NSP)	MN	1	6	Wind	12/31/2020
Sterlington 1-4 & 6-10	LAGN	LA	9	98.5	Gas	12/31/2020
Dallman Units 31 & 32	CWLP	IL	2	180	Coal	3/1/2021
Gallagher Units 2 and 4	DEI	IN	2	280	Coal	6/1/2021
Petersburg Unit 1	IPL	IN	1	253	Coal	6/1/2021
River Rouge Unit 3	ITCT	MI	1	110	Coal	6/1/2021
Schahfer Unit 14 & 15	NIPS	IN	2	1096.4	Coal	10/1/2021
Moulton and Champepadan Wind	GRE	MN	2	3.96	Wind	11/30/2021
Dolet Hills	CLEC	LA	1	304.8	Coal	12/31/2021
Boswell Units 1 and 2	MP	MN	2	150	Coal	1/1/2022
Portage CT	UPPC (ATC)	MI	1	27	Oil	1/11/2022
Lewis & Clark Unit 1	MDU	MT	1	52.3	Coal	2/15/2022
Elk River Station	GRE	MN	3	49	Biomass	3/22/2022
Lake Front T6	WPS (ATC)	WI	1	33	Coal	9/19/2022
Gallagher Unit 2 and 4	DEI	IN	2	280	Coal	12/31/2022
St. Clair Unit 2,3,6 and 7	ITCT	MI	4	1100	Coal	12/31/2022
Meramec CTG 2	AMMO	MO	1	50	Oil	12/31/2022
Weston Unit 2	WPS (ATC)	WI	1	24	Coal	2/7/2023
Baxter Wilson Unit 1	EES	MS	1	494.3	Gas	3/30/2023
Robert NewBerry	MIUP (ATC)	MI	1	2	Oil	5/31/2023
Karn Unit 1&2	METC	MI	2	515	Coal	6/1/2023
Northeast Peaker 11-1	ITCT	MI	1	13.2	Coal	6/1/2023
Petersburg Unit 2	IPL	IN	1	6.8	Coal	7/1/2023
Grand Tower Units 1-4	AMIL	IL	4	517	Gas	9/7/2023
Marion Unit 4	SIPC	IL	1	180	Coal	11/1/2023
Genoa Unit 3	DPC	WI	1	306.8	Coal	12/6/2023
Riverside Unit 5	MEC	IA	1	136	Coal	12/11/2023
Waterford Unit 1	EES	LA	1	411.2	Gas	2/17/2024
Dallman Unit 33	CWLP	IL	1	188	Coal	3/1/2024
Muscatine Unit 8A	MPW	IA	1	21	Coal/Gas	5/1/2024
Teche Unit 3	CLEC	LA	1	335	Gas	6/1/2024
Freedom Power Station	AMIL	IL	1	47	Gas	6/1/2024
* Former MISO Generation Resources						

ORAL ARGUMENT NOT YET SCHEDULED

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

STATE OF NORTH DAKOTA, et al., Petitioners, v. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, Respondent.	Case No. 24-1119 (and consolidated cases)

DECLARATION OF MELANIE LOYZIM, COMMISSIONER,
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

I, Melanie Loyzim, state and declare as follows,

I. Purpose of this Declaration

1. I am the Commissioner of the Maine Department of Environmental Protection (DEP). In this capacity, I am responsible for overseeing DEP's six divisions, including the Bureau of Air Quality and the Bureau of Water Quality. The Bureau of Air Quality (BAQ) implements air quality programs pursuant to the Clean Air Act and state law. The BAQ monitors air quality across the state, licenses emissions from larger facilities, and conducts compliance assistance and inspection visits. The Bureau of Water Quality (BWQ) implements water quality programs

pursuant to the Clean Water Act and state law. The BWQ is responsible for managing, protecting, and enhancing the quality of Maine's water resources through voluntary, regulatory, and educational programs. The BAQ and the BWQ collaborate with local, state, and federal agencies to plan and implement strategies to protect Maine's air and water quality. Staff of both bureaus are involved in monitoring mercury deposition and its effects within Maine.

2. I submit this declaration on behalf of the State of Maine in support of the intervenor-respondent state and local governments' opposition to the motions to stay the Environmental Protection Agency's (EPA) final rulemaking action entitled *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*, 89 Fed. Reg. 38, 508 (May 7, 2024) (MATS RTR), which strengthens the Mercury and Air Toxics Standards (MATS), 77 Fed. Reg. 9304 (Feb. 16, 2012). The MATS require power plants across the nation to limit emissions of hazardous air pollutants, including mercury, and have been crucial to protecting Maine's public health and natural resources from the dangers of out-of-state power plant mercury emissions.

II. Experience and Qualifications

3. I have been with DEP since 2006. Prior to serving as Commissioner, I served in a variety of roles, including underground tank inspector, air toxics and

emissions inventory program manager, Director of the BAQ and the Bureau of Remediation and Waste Management, and Deputy Commissioner. Prior to my tenure at DEP, I worked for Colorado's Department of Public Health and Environment in their emissions inventory program and as a rule writer. I also have experience as an Environmental, Health, and Safety Consultant; a Site Health and Safety Officer; and 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) trainer.

4. I hold a Bachelor of Science degree in Natural Resource Economics from the University of Maine and a Master of Public Administration from the University of Colorado Denver. My curriculum vitae is attached as Exhibit A to this declaration.

III. Maine's Waterbodies, Freshwater Fisheries, and Wildlife Are Contaminated with Mercury.

5. Mercury is a potent toxin that causes adverse effects to the neurological, immune, kidney, and cardiovascular systems of humans and wildlife. The brains and developing nervous systems of fetuses and children are especially vulnerable to mercury exposure, even at low levels. Because consumption of mercury-contaminated fish is the primary source of human exposure to mercury, DEP, in coordination with the Maine Center for Disease Control & Prevention (CDC) and other state agencies, has been assessing the levels of mercury contamination in Maine's freshwater fish for decades to evaluate the extent of mercury contamination

in Maine waters and reduce the health risks to the public from consumption of mercury-contaminated fish.

6. Although there are natural sources of mercury, anthropogenic sources, such as the burning of fossil fuels, incineration of mercury-containing waste materials, and the use of mercury in industrial processes, are most significant. Atmospheric deposition of mercury, caused by the long-range transport of mercury emissions from such sources, especially coal-fired power plants, is responsible for much of the mercury contamination in Maine. Coal-fired power plants are the second largest single source of anthropogenic mercury emissions in the United States behind electric arc furnaces, based on the 2020 National Emissions Inventory (NEI)[1]. Once released to the air, mercury is deposited onto soil and into waterbodies through precipitation and transformed into methylmercury by microorganisms. Methylmercury is a highly toxic, bioavailable form of mercury that bioaccumulates in fish, creating a risk to humans and wildlife that consume those fish.

7. In Maine, mercury contamination of waterbodies is widespread and substantial. Mercury levels in Maine fish, loons, and eagles are among the highest in North America. In 1992 and 1993, DEP, in cooperation with the Maine Department of Inland Fisheries and Wildlife, conducted a study under the EPA's

[1] EPA, *2020 National Emissions Inventory Technical Support Document: Overview* 2-24 (Mar. 2023), https://www.epa.gov/system/files/documents/2023-01/NEI2020_TSD_Section2_Overview_0.pdf.

Regional Environmental Monitoring and Assessment Program (REMAP). This study resulted in a Statewide Fish Consumption Advisory due to mercury for all freshwater lakes and ponds in 1994. Subsequently, monitoring by DEP's Surface Water Ambient Toxic (SWAT) monitoring program from 1994 to 1996 resulted in the addition of rivers and streams in Maine to the fish consumption advisory due to mercury in 1997.

8. Despite the significant reductions in mercury emissions that have occurred from coal-fired power plants as a result of the MATS, all fresh waters in Maine remain subject to a Fish Consumption Advisory recommending that Mainers, particularly pregnant and nursing women, women of childbearing age, and young children, limit their fish consumption based on the type of fish they consume.[2] Although there has been a general decrease in mercury concentrations in fish in the Northeast U.S. in recent decades, many fish in Maine still exceed Maine's mercury fish tissue action level of 200 nanograms per gram (ng/g) wet weight parts per billion (ppb). Greater reductions are needed from coal-fired power plants and other sources of mercury to further reduce mercury concentrations in Maine's freshwater fish.

[2] *See* Maine CDC, Division of Environmental and Community Health, *Freshwater Fish Safe Eating Guidelines*, https://www.maine.gov/dhhs/mecdc/environmental-health/eohp/fish/2kfca.htm.

9. Maine waters subject to the Fish Consumption Advisory due to mercury contamination include Great Ponds, to which the State holds title in trust for the public.[3]

10. Additionally, all fresh waters in Maine are listed for an Impaired Fish Consumption Use caused by atmospheric deposition of mercury from sources beyond Maine, pursuant to Clean Water Act section 303(d), 33 U.S.C. § 1313(d).[4]

11. In 2019, Maine created a sustenance fishing designated use for certain waters, establishing the nation's most protective standards for mercury in fish.[5] This protective standard recognizes the high level of fish consumption by tribal communities in Maine and the importance of sustenance fishing to the health and culture of those communities.

IV. Maine Has Made Significant Efforts to Reduce Mercury Contamination of Its Waters and Natural Resources.

12. For more than forty years, Maine has been monitoring the levels of mercury contamination in its waterbodies, fisheries, and wildlife. DEP has collected and tested samples of freshwater and marine fish, marine shellfish, mink, otter, loons, cormorants, other birds, seals, sediments, and water for mercury beginning in

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[3] *See* 38 M.R.S. §§ 436-A(7), 480-B(5) (defining "great pond"); 17 M.R.S. § 3860.
[4] Maine DEP, *2018/2020/2022 Integrated Water Quality Monitoring and Assessment Report* 13 (May 25, 2022), https://www.maine.gov/dep/water/monitoring/305b/2022/25-May-2022_2018-22_ME_IntegratedRpt-REPORT%20(002).pdf.
[5] *See* P.L. 2019, ch. 463, § 5; 38 M.R.S. § 466-A.

the mid-1980s until 2018. DEP also supports the operation and maintenance of four monitoring sites that are part of the National Atmospheric Deposition Program (NADP) and Mercury Deposition Network (MDN) in Greenville, Bridgton, Freeport, and Caribou.[6] DEP jointly sponsors additional sampling at Bar Harbor (with the National Park Service) and Carrabassett Valley (with the Penobscot Indian Nation).[7]

13. In 2015-2018, DEP incurred annual expenses of approximately $10,000 to $50,000 for the collection and analysis of fish and wildlife tissue samples and approximately $72,000 for air monitoring related to mercury alone. Additionally, within the BWQ, several employees ranging from Environmental Technicians to Biologist IIIs devoted a portion of their work time to the monitoring program with an average annual contribution of 0.4 full-time equivalent or about $28,000 per year. Within the BAQ, deposition-related monitoring labor costs of Environmental Specialists are approximately $16,000 per year. Because atmospheric mercury deposition, including from coal-fired power plants, is the leading source of mercury contamination in Maine waters, these costs of DEP's monitoring program have been driven, in large part, by that pollution.

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[6] Maine DEP, *Five-Year Assessment of Maine's Ambient Air Monitoring Network* 35 (May 19, 2021), https://www.maine.gov/dep/air/monitoring/docs/maine-five-year-air-monitoring-assessment-2020.pdf.
[7] *Id.*

14. DEP has participated in the NADP and the MDN since the 1990s. In 1998, Maine joined with the other New England states and the Eastern Canadian Provinces to adopt a Regional Mercury Action Plan, with the goal of reducing by 50 percent anthropogenic mercury releases within the region by 2003.[8]

15. To reach that goal, Maine banned the sale of a wide array of products containing mercury;[9] enacted product stewardship and labeling programs for products containing mercury;[10] required dental facilities to install amalgam separators;[11] limited air emissions of mercury within the state;[12] and implemented effluent limitations and mercury controls for facilities discharging wastewater.[13]

16. Between 1987 and 2022, Maine reduced in-state emissions of mercury to the air by almost 97%, from 1,051 lb of mercury emissions reported in 1987 to 32 lb in 2022.[14] However, although Maine has taken aggressive action to reduce sources of mercury within the State's jurisdiction, further action will be required

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[8] *See* Conference of New England Governors and Eastern Canadian Premiers, *Mercury Action Plan 1998* (June 1998), https://www.mass.gov/doc/new-england-governorseastern-canadian-premiers-mercury-action-plan/download.

[9] *See* 38 M.R.S. §§ 1661-C, 1665-A, 1665-B.

[10] *See* 38 M.R.S. §§ 1662, 1663, 1664; *see also* 06-096 C.M.R. chs. 870, 872.

[11] *See* 38 M.R.S. § 1667.

[12] *See* 38 M.R.S. § 585-B. There are no coal-fired power plants in Maine. *See* Maine DEP, *Title V (Major) Sources*, https://www.maine.gov/tools/whatsnew/index.php?topic=DEP+Title+V; Maine DEP, *Chapter 115 (Minor) Sources*, https://www.maine.gov/tools/whatsnew/index.php?topic=DEP+Minor+Source.

[13] *See* 38 M.R.S. § 420; *see also* 06-096 C.M.R. ch. 519.

[14] *See* Maine Toxic Release Inventory (TRI) 1987-2022.

from sources outside the State's boundaries to provide the desired reduction of mercury in Maine's waters.[15]

V. The MATS Requirements Are Needed to Ensure Maine Waters are Safe from Mercury Pollution.

17. Mercury pollution, including from coal-fired power plants in upwind states, is carried by the wind across state borders. Maine DEP's ambient air monitoring network report released in 2021, *Five-Year Assessment of Maine's Ambient Air Monitoring Network,* identified eleven upwind states as being the most significant contributors to mercury deposition in Maine.[16] As a result, in addition to implementing the rigorous in-state mercury control measures, Maine has worked with other states in the region to address mercury pollution, among other pollutants, emitted from sources in upwind states.

18. In particular, in 2007, Maine, other New England states, and New York petitioned EPA to establish a Northeast Regional Mercury Total Maximum Daily Load (TMDL) pursuant to the federal Clean Water Act, 3 U.S.C. § 1313(d)(1) (requiring TMDLs for impaired waters). That EPA-approved TMDL sets a mercury budget that is projected to reduce mercury contamination in the region's waters to

[15] *2018/2020/2022 Integrated Water Quality Monitoring and Assessment Report* 13.
[16] Maine DEP, *Five-Year Assessment of Maine's Ambient Air Monitoring Network* 35.

levels that will allow for the lifting of fish consumption advisories.[17] Modelling undertaken as part of the TMDL process showed that mercury emissions from sources in states immediately upwind of the TMDL region were responsible for 40 percent of the contribution to the region from the continental United States.[18] As a result, the TMDL concluded that it will be necessary to reduce deposition of anthropogenic atmospheric mercury in the region by 98 percent to reach the targeted safe mercury levels.[19] This will require significant reductions from upwind out-of-region sources, primarily coal-fired power plants,[20] which the MATS has been essential to accomplishing.

19. The MATS has also benefited eastern states, like Maine, by reducing power-plant emissions of criteria pollutants, like sulfur dioxide and particulate matter. EPA has credited reductions from the MATS with assisting eastern states in meeting the daily and annual fine particulate matter national ambient air quality standards (NAAQS).[21] In addition to attaining and maintaining compliance with the

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[17] *See Northeast Regional Mercury Total Maximum Daily Load* (Oct. 24, 2007), https://neiwpcc.org/wp-content/uploads/2020/08/FINAL-Northeast-Regional-Mercury-TMDL.pdf.

[18] NESCAUM, *Sources of Mercury Deposition in the Northeast United States* 1 (Mar. 2008), http://www.nescaum.org/documents/nescaum-sources-of-hg-depo-in-northeast_2008-final.pdf/.

[19] *See Northeast Regional Mercury Total Maximum Daily Load* 31, 39.

[20] *Id.* at 44.

[21] NESCAUM, *It Remains "Appropriate and Necessary" to Regulate Toxic Air Emissions from Coal- and Oil-fired Electric Generating Units* 19 (Updated Apr. 7,

NAAQS, EPA requires states to develop long-term strategies that address visibility-impairing haze—to which particulate matter contributes—in designated federally protected national parks and wilderness areas (Class I areas), like Acadia National Park and the Moosehorn Wilderness Area in Maine, and the Roosevelt Campobello International Park. The reductions of those pollutants attributable to the MATS, including through the MATS RTR, have helped and will continue to help in attaining and maintaining the NAAQS, as well as in reducing regional haze impacts to Class I areas in Maine and throughout the United States.

I declare, to the best of my knowledge and under the penalty of perjury under the laws of the United States, that the foregoing is true and correct.

Executed on June 26, 2024, at Augusta, Maine.

Melanie Loyzim
Commissioner
Maine Department
of Environmental Protection

2022), https://www.nescaum.org/documents/nescaum-it-remains-approp-necess-reg-air-toxics-from-coal-oil-egus-update-20220407.pdf.

MELANIE LOYZIM

Skills

- Trusted leader, collaborator
- Policy development and analysis
- Organizational, project and personnel management
- Budget development and fiscal management
- Environmental data analysis and presentation

Experience

COMMISSIONER

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP) (2021-CURRENT)

- Lead agency of 400+ employees, with direct supervision of 12 managers
- Oversee all DEP programs and decisions, including licenses, enforcement, rulemaking, budget, and implementation of federally delegated programs
- Develop and present legislation
- Co-Chair of Maine Climate Council, including Co-Chair of Materials Management Task Force and co-Chair of Industrial Emissions Task Force
- Chair of Ozone Transport Commission (2023-2024)
- Regional Greenhouse Gas Initiative Board Member
- Interstate Chemical Clearinghouse Board Member

DEPUTY COMMISSIONER

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION (2016-2021)

- Assisted Commissioner in overseeing all matters before DEP, including customer service, legislation, policy development, compliance assistance, enforcement, personnel, finances, and property
- Developed and presented DEP's FY18/19 Budget to ENR and Appropriations Committees
- Managed, assisted with drafting, collaborated with Environmental Priorities Coalition, and presented to BEP and Legislature revised rules for metallic mineral mining
- Collaborated with legislators to evaluate and amend bills, drafted legislative proposals, and coordinated with Governor's office

COMMUNICATIONS DIRECTOR

REMEDY COMPASSION CENTER (2015-2016)

- Reviewed horticultural, processing, and retail operations and implemented changes to ensure compliance with state medical marijuana laws and federal standards under OSHA and FDA

- Developed SOPs for biosecurity, quality assurance, product manufacturing, inventory control, and waste management
- Conducted outreach to potential partners on health care issues and tracked legislation

Director of Bureau of Remediation and Waste Management

Maine Department of Environmental Protection (2012-2015)

- Managed licensing, compliance, cleanup and monitoring programs involving petroleum, solid and hazardous wastes
- Promoted coordination of RCRA and Voluntary Response Action programs with EPA to enable redevelopment of Brownfields sites
- Represented DEP position on proposed legislation, including drafting testimony, participating in hearings and work sessions, and bipartisan collaboration with stakeholders and legislators
- Drafted legislative reports and 5-year update to Maine's Waste Management Plan
- Trained to participate in Joint Incident Command for inland, marine, and US-Canadian border oil spills
- Responsible for more than 150 staff in 6 Divisions

Director of Bureau of Air Quality

Maine Department of Environmental Protection (2011-2012)

- Managed air quality licensing, compliance, and monitoring programs and agency-wide IT and financial services
- Initated study of waste-to-energy facility emissions from pharmaceutical combustion and authorized in-state destruction of drug take-back program wastes to support increased take-back events
- Developed agency-wide zero-based budget for FY14/15, including compilation and categorization of tasks performed by all DEP staff
- Negotiated settlement of enforcement cases
- Collaborated with Maine Lung Association to evaluate woodsmoke emission impacts and reduction strategies
- Responsible for 50 staff in 3 Divisions

Air Toxics and Emission Inventory Section Manager (ES IV)

Maine Department of Environmental Protection (2008-2011)

- Tracked Clean Air Act rule changes for emissions reporting, hazardous air pollutant and greenhouse gas emissions requirements
- Coordinated unit to develop state-wide emissions inventories of criteria pollutants, hazardous air pollutants, and greenhouse gases, including researching activity data, calculating emissions, and creating reports utilizing Excel and Access tools
- Coordinated IT projects and data management for all Bureau programs, including data analysis and summaries for legislative proposals
- Supervised 6 staff

UNDERGROUND OIL STORAGE TANKS INSPECTOR (ES II & III)

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION (2006-2008)

- Provided compliance assistance to UST owners/operators and tank installers and inspectors, performed compliance inspections, reviewed annual reports and repair information, managed enforcement cases, and created custom Access queries of database to perform quality assurance of facility information

RULE WRITER AND ODOR INSPECTOR (ES II)

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT (2002-2004)

- Managed stakeholder group for adoption of Clean Air Mercury Rule, including coal-fired electric utilities and Environmental Defense Fund
- Drafted regulatory language and worked with Air Quality Control Commission to adopt state rules to implement the 2002 NSR Reform package, MACT/NSPS/Section 129 standards, and ozone control
- Coordinated with EPA Region 8 to incorporate a 10-year backlog of rule changes into Colorado's State Implementation Plan
- Identified and assisted facilities subject to new MACT and NSPS emission control standards
- Hog farm odor compliance officer: provided compliance assistance, performed inspections, drafted enforcement documents, reviewed submissions from regulated farms, managed contracted study of dissolved oxygen in waste lagoons

AIR EMISSIONS INVENTORY SPECIALIST (ES I)

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT (2002-2004)

- Reviewed annual emission reports from licensed facilities, including performing emission calculations, evaluating against license requirements, correcting emission factors, and data entry

SITE SAFETY OFFICER AND TRAINER

MILLER ENVIRONMENTAL SERVICES, DENVER, CO (2000-2002)

- Ensured compliance with OSHA Construction Safety standards for underground utility installation companies on Brownfields redevelopment sites
- Conducted confined space monitoring using multi-gas meter and soil headspace sampling
- Provided 40-hr HAZWOPER and 4-hr Confined Space safety training classes for underground utility installation contractors

Education

BACHELOR OF SCIENCE IN NATURAL RESOURCE ECONOMICS, MINOR ENVIRONMENTAL PRE-LAW
University of Maine, Orono (2000)

MASTER OF PUBLIC ADMINISTRATION
University of Colorado, Denver (2003)

DECLARATION OF AMLAN SAHA

I, Amlan Saha, declare as follows:

1. I am Director and Principal at PT Strategy and Intelligence, LLC, where I provide strategic consulting and analytical services with a specific focus on energy and environmental issues. I work with energy sector clients and non-governmental organizations advising them on complex market and policy issues associated with the transition to a low carbon economy. In my current role, and prior to that, for nearly 20 years, at M.J. Bradley & Associates, ERM, and Engie, I have led and conducted extensive research and undertaken numerous studies on a range of fossil fuel and clean energy issues, including power plant economics, operating performance of energy systems, and the impacts of new regulation and policies on the financial and economic viability of energy resources. I have also built economy-wide carbon pathways models that utilities have used to conduct climate scenario analyses. I hold a bachelor's degree in engineering from the National University of Singapore, an MBA from L'Ecole des Hautes Etudes Commerciales (HEC Paris), and a master's degree in law and diplomacy from the Fletcher School at Tufts University. My curriculum vitae is attached as Attachment A.

2. I understand that the U.S. Environmental Protection Agency ("EPA") recently finalized the *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*, 89 Fed. Reg. 38,508 (May 7, 2024) (MATS Update Rule). I have reviewed the Rule, as well as the *Regulatory Impact Analysis for the Final National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-fired Electric Utility Steam Generation Review of the Residual Risk and Technology Review* (RIA) which summarizes EPA's cost analyses. Additionally, I studied the *2024 Update to the 2023 Proposed Technology Review for the Coal- and Oil-fired EGU Source Category,* Docket ID. No. EPA-HQ-OAR-2018-0794-6919 (Jan, 2024) (2024 Technical Memo) and the earlier *2023 Proposed Technology Review for the Coal- and Oil-fired EGU Source Category*, Docket ID. No. EPA-HQ-OAR-2018-0794-5789), which the 2024 Technical Memo updated. These two memos provide important data and analysis of practices, processes, and control technologies that may be available to sources subject to the MATS Update Rule. I also reviewed the documentation for EPA's Power Sector Modeling Platform 2023 Reference Case,[1] which describes the Integrated Planning Model (IPM), a multi-regional model of the U.S. electric power sector that is used by EPA

[1] EPA, Documentation for 2023 Reference Case, *EPA's Power Sector Modeling Platform 2023 Using IPM*, https://www.epa.gov/power-sector-modeling/documentation-2023-reference-case.

to evaluate costs and emissions impacts of proposed and finalized policies for the power sector.

3. I believe EPA's analyses and conclusions are reasonable and well supported, as discussed further below.

4. I conducted an analysis of the potential impacts of the MATS Update Rule on the operational and financial viability of affected coal plants.

5. For my analysis I developed a simplified and high-level Excel-based cashflow model[2] that includes the just under 300 U.S. coal-fired electric generating units (EGUs) that EPA indicated are likely to be subject to the MATS Update Rule.[3] To assess the impacts of the MATS Update Rule the model first estimates baseline discounted net present values (NPV) and levelized costs of electricity (LCOE) for each EGU before applying the requirements of the MATS Update Rule. It then recalculates both these metrics for each EGU after factoring in applicable MATS Update Rule related requirements. Compliance options are

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[2] Baseline dataset in the model is constructed using data from S&P Capital IQ Pro, EPA NEEDS for 2023 Reference Case, EPA Clean Air Markets Program Data, EIA Survey File 860, and attachment spreadsheets to the 2024 Technical Memo. Capacity factors and operational cost data including fixed operating and maintenance (FOM), variable operating and maintenance (VOM), and fuel cost are derived from S&P Capital IQ Pro datasets. Future regional energy and capacity revenues are mapped from EPA's IPM outputs for the MATS Update Rule. Pollution control equipment costs including capital expenditures and operational costs are derived from the 2024 Technical Memo and other documents made available through the MATS Update Rule docket.

[3] Note that while the model includes all of the coal-fired EGUs that are subject to the MATS Update Rule, many of the included EGUs are already in compliance with the requirements of the rule.

selected in the model based on each EGU's currently installed set of pollution control equipment and its reported emissions, where available. The differences between the EGUs' estimated baseline and compliance NPVs and LCOEs allow me to make inferences about the potential impacts of the MATS Update Rule that are outlined throughout the rest of this declaration. Specifically, if an EGU's NPV goes from a positive value under the baseline scenario to negative under the compliance scenario, it is considered to be a potential candidate for retirement. Likewise, increases in LCOEs from the baseline to the compliance scenario would indicate that the EGU may need an equivalent uplift in revenues to be made whole.

6. The overall results of my analysis are consistent with EPA's conclusion that the MATS Update Rule is not likely to result in any incremental retirements, all else being equal.

7. My analysis estimates two key metrics—NPV and LCOE—each under baseline and compliance scenarios for each of the EGUs that would be subject to the MATS Update Rule. The NPV of an EGU is a key metric that may be used to assess the profitability of that EGU over a given forward-looking time horizon. It represents the difference between the discounted present value of all revenues received by the EGU and the discounted present value of all costs incurred by the same EGU over the given time horizon. The costs include any capital expenditure that may be required to install new or upgrade existing

pollution control equipment as well as changes to the ongoing operational costs of the EGU due to the compliance requirements of the MATS Update Rule. Revenues include projected energy and capacity revenues for each EGU based on its location. Note that some EGUs may also be able to receive additional compensation from providing key ancillary services to the grid.[4] These revenues typically constitute relatively smaller components of total EGU revenue and are not included in my analysis, although, on the margin, they could potentially make a difference for an EGU that would otherwise opt to retire. In general, all else being equal, a positive NPV indicates that an EGU is expected to generate more revenue than its costs, making it financially viable. No EGUs in my analysis see their NPV turn negative under the compliance scenario. Additionally, more than 91% of the EGUs subject to the MATS Update Rule with positive NPVs saw declines in their NPVs of no more than 5% under the compliance scenario. My analysis also suggests that nearly 40% of all EGUs subject to the MATS Update Rule may

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[4] Ancillary services may include frequency regulation, voltage support, black start capability, etc. Regional grid operators may run ancillary services markets that are separate from their energy and capacity markets. For example, PJM runs a regulation market to provide market driven compensation to EGUs that help maintain a system frequency of 60 Hz. See PJM, *Ancillary Services Market*, https://learn.pjm.com/three-priorities/buying-and-selling-energy/ancillary-services-market

already have negative NPVs even before factoring in any of the requirements of the rule.[5]

8. The LCOE of an EGU is a second key metric that allows for the assessment of how the total cost of generating electricity could change as a result of having to comply with the MATS Update Rule. LCOE represents the average cost per unit of electricity generated by an EGU over a given time horizon, taking into account all forward-going costs including capital investments, fixed and variable operation and maintenance costs, and fuel, and dividing them by the total electricity output produced over that period. All else being equal, the magnitude of any increase in the LCOE of an EGU under the compliance scenario indicates the additional amount of revenue that would be needed per unit of electricity generated for the EGU to be made whole. My analysis suggests that nearly 70% of the studied EGUs' LCOEs would increase by less than 0.1% under the compliance scenario and only nine EGUs would see their LCOEs rise by more than 5%. The rise in LCOEs is driven primarily by the capital expenditures incurred by affected

[5] Other studies have also found that coal-fired EGUs in most major U.S. electricity regions may already be financially unviable. For example, one study found that between 2015 and 2022, coal-fired EGUs in the Southeast racked up losses of more than $5 billion. As most of these losses were at plants that were owned by vertically integrated utilities in regulated markets, the utilities were likely able to pass on the losses to ratepayers to sustain continued operations. See RMI, *Utility Transition Hub*, https://utilitytransitionhub.rmi.org/economic-dispatch/ and Minho Kim, *Electricity From Coal Is Pricey. Should Consumers Have to Pay?*, The New York Times (May 31, 2024), https://www.nytimes.com/2024/05/31/climate/electricity-from-coal-is-pricey-should-consumers-have-to-pay.html for more details.

EGUs under the compliance scenario, which my analysis estimates to be just over $750 million (2022$) across all affected EGUs. By comparison, in 2023, total capital expenditure of all U.S. investor-owned utilities was projected to be $172 billion,[6] more than 200 times the estimated total capital expenditure required by the affected EGUs under the compliance scenario.

9. The relationship between compliance-driven changes in the LCOE of EGUs and impact on retail customer electricity rates is neither immediate in time, direct, nor one-to-one. The magnitude and timing of the impact on retail customer rates, if any, would depend on several factors. In most of the U.S., a utility's customer retail rates are set by a state public utility commission or an equivalent body (e.g., boards and city councils at municipal utilities, public utility districts, rural cooperatives, etc.) at the request of a utility using "cost of service regulation"[7] under which the commission determines the total amount of revenue that the utility is allowed to recover from its customers through retail rates. Also called the utility's "revenue requirement," this amount comprises the cost of providing electricity on a least cost basis and a reasonable "authorized" rate of return on

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[6] See EEI, *Industry Capital Expenditures*, https://www.eei.org/-/media/Project/EEI/Documents/Issues-and-Policy/Finance-And-Tax/Industry-Capital-Expenditures.pdf.

[7] Cost of service regulation is used here to denote a traditional cost-plus regulation regime. Several variants of traditional cost-plus regulation exist today in the U.S., including revenue decoupling and performance-based regulation mechanisms. Any compliance cost related rate increase would still need to be approved by regulators under these regimes.

investments and capital assets (about 10 percent, on average, in most cases).[8] A utility that wants to recover any potential MATS Update Rule related compliance costs from its customers must submit a proposed rate change to its regulator. The submission will set in motion a well-established multi-step regulatory process in which the utility must present its case for a rate change in hearings while being subjected to cross-examination, negotiate with multiple stakeholders including ratepayer advocates, and convince regulators of the necessity for the change including by demonstrating that the costs would be prudently incurred and the rate is just and reasonable.[9] The entire process usually takes a year or more to complete.

10. To demonstrate that costs would be prudently incurred, utilities often go through integrated resource planning (IRP) processes that seek to identify the most cost-effective compliance and electricity procurement options for their customers. These plans generally go through a public process and are subject to scrutiny by the public and regulators (or by publicly owned utilities' boards, as appropriate). The least-cost planning exercises they entail are more likely than not to identify alternative procurement options, in part or whole, that result in lower

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[8] See Dan Lowrey, *Electric beats gas in exceeding authorized equity returns over past 15 years*, S&P Global (May 25, 2023), https://www.spglobal.com/marketintelligence/en/news-insights/research/electric-beats-gas-in-exceeding-authorized-equity-returns-over-past-15-years.

[9] Rate request processes at consumer- and publicly-owned utilities—e.g., municipal utilities, public utility districts, rural cooperatives, etc.—are usually more streamlined than the multi-step process outlined here, given their typically non-profit status and different incentive, accountability, and ownership structures from investor-owned utilities.

overall costs for ratepayers leading regulators to allow none or only part of the compliance costs to be included in a utility's "revenue requirement," and, therefore, recovered from ratepayers.

11. Furthermore, in deregulated states with restructured electric sectors, where public utilities have divested or do not own EGUs, the "merchant" EGUs, as EGUs tend to be known in deregulated markets, must rely on wholesale markets to recoup their compliance costs. The EGUs' ability to do so largely depends on an increase in the overall levelized costs of electricity in their markets going forward. This is unlikely, as the shares of renewable resources are slated to increase in most U.S. states and electricity markets between now and 2050.[10] LCOEs of utility scale wind and solar, the two dominant renewable energy generation technologies, declined 65% and 83%, respectively, between 2009 and 2023 and the trend is likely to continue, not least due to the incentives available under the Inflation Reduction Act.[11] At the same time, the economics of coal-fired EGUs continue to

[10] As of 2023, nearly 60% of all U.S. retail electricity sales were subject to rising renewable or clean portfolio standards, which require utilities to procure a certain rising share of generation from clean resources. Complying with these standards is estimated to increase the share of non-hydro renewable generation from 17% of total U.S. electricity sales to about 28% in 2050. When the tax credit provisions of the Inflation Reduction Act (IRA) are taken into account, the projected share of renewable generation in 2050 is much higher at 57% and more than 70% under some scenarios. See Galen Barbose, Berkley Lab, *U.S. State Renewables Portfolio & Clean Electricity Standards: 2023 Status Update*, https://eta-publications.lbl.gov/sites/default/files/lbnl_rps_ces_status_report_2023_edition.pdf.

[11] See Lazard, *Levelized Cost of Energy+* (June 2024), https://www.lazard.com/media/xemfey0k/lazards-lcoeplus-june-2024-_vf.pdf.

worsen. As the U.S. coal-fired EGU fleet continues to age, their capital expenditure needs, and therefore LCOEs, are likely to increase going forward—for each decade of increase in age, coal-fired EGUs' average capital expense needs are estimated to increase by about 5%.[12] Coal-fired EGUs' fuel supply is also increasingly becoming less reliable and prices potentially more volatile, with utilities resorting to more spot and short-term contracts.[13] In a recent IRP proceeding, one of the largest utilities in the country noted that "[…] there is potential for […] increased risks of non-performance, higher prices and less flexibility […]" in the coal supply chain going forward.[14] As a result, virtually all existing coal-fired EGUs are now more expensive to operate on a forward-going basis (i.e., only considering their operating costs) than new wind and solar resources.[15] Regulators in several states are beginning to disallow the recovery of

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[12] See U.S. EIA, *Generating Unit Annual Capital and Life Extension Costs Analysis* (Dec. 2019), https://www.eia.gov/analysis/studies/powerplants/generationcost/pdf/full_report.pdf; these capital expenditures are generally required at all plants to replace degraded plant equipment and other upgrades that are necessary to support ongoing operations.

[13] Spot contracts are transactions under which coal is purchased by an EGU at current market price for immediate delivery. Spot contracts accord greater flexibility, but also exposes the EGU to market fluctuations in the price of coal. By contrast, longer-term agreements use futures contracts to provide for delivery at a future date and at pre-negotiated prices based on the expectations of future market conditions. In general, longer-term agreements provide for higher degrees of price stability, greater security of fuel supply, and allow EGUs to hedge against future price fluctuations.

[14] See Coal Retirement Analysis (Appendix F), *Duke 2023 Carolinas Resource Plan*, https://www.duke-energy.com/-/media/pdfs/our-company/carolinas-resource-plan/appendix-f-coal-retirement-study.pdf

[15] See Michelle Solomon et. al., *Coal Cost Crossover 3.0: Local Renewables Plus Storage Create New Opportunities for Customer Savings and Community Reinvestment* (Jan. 2023), https://energyinnovation.org/wp-content/uploads/2023/01/Coal-Cost-Crossover-3.0.pdf.

coal-fired EGU costs from ratepayers when more economic alternatives are available through electricity markets.[16]

12. Because the vast majority of the affected EGUs are projected to see very small LCOE increases under the compliance scenario, most utilities may not even consider initiating the relatively involved and multi-step rate case proceedings to solely recoup the minimal costs associated with complying with the MATS Update Rule, in which case the utilities would treat the costs as regular costs of doing business and they would have no impact on customer rates. Utilities often go years without requesting a rate case proceeding in many states. They tend to resort to rate cases for the recovery of large capital investments and other major costs. For example, between 2021 and 2023, investor-owned electric utilities in the U.S. submitted rate increase requests totaling, on average, about $13 billion each year.[17] In comparison, the estimated $750 million of total capital expenditure incurred by the affected EGUs under the compliance scenario is only about 6% of the total rate increase request amount.

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[16] See *Indiana Michigan Power Company*, Michigan Public Service Commission Case No. U-20805 (April 11, 2024), https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y00000CxtfBAAR and *CLECO Power*, Louisiana Public Service Commission, Docket Number U-35753, https://lpscpubvalence.lpsc.louisiana.gov/portal/PSC/ViewFile?fileId=JSX88FRVY68%3d.

[17] See Dan Lowrey, *Rate requests by US energy utilities set record in 2023 for 3rd straight year*, S&P Global (Feb. 7, 2024), https://www.spglobal.com/marketintelligence/en/news-insights/research/rate-requests-by-us-energy-utilities-set-record-in-2023-for-3rd-straight-year.

13. It is important to also note that even if a utility decided to submit a rate increase proposal to incorporate MATS Update Rule related costs into customer rates, the costs would not be collected from ratepayers in one single year. Cost recovery would be spread over the remaining useful life of the asset, which in this case could be until the affected EGU is retired. Therefore, for most utilities, the impact on their retail customers of the MATS Update Rule, if any, is likely to be minimal.

14. The economics of U.S. coal-fired power plants have been deteriorating since around 2008 due largely to secular market forces, economic trends, and other reasons that are independent of the MATS Update Rule. Coal's share of U.S. electricity production declined from over 48% in 2008 to just 16% in 2023, a reduction in output of over 66%.[18] Over the same period, the generating capacity of U.S. coal-fired EGUs decreased from 313 GW to about 170 GW due to significant EGU retirements.[19] This trend is expected to continue, as nearly half of the currently operating coal EGUs have already announced a date to retire or convert to fire with natural gas.[20] In fact, it is likely that actual coal-fired EGU retirements may even accelerate, as has historically been the case relative to

[18] See EIA, *Survey File 923*,https://www.eia.gov/electricity/data/eia923/.
[19] See EIA, *Electric Power Annual 2008* (Jan 2010), https://www.eia.gov/electricity/annual/archive/pdf/03482008.pdf, EIA, *Survey File 860 2023 Early Release*, https://www.eia.gov/electricity/data/eia860/, and EPA, NEEDS 2023 Reference dataset.
[20] Based on EPA NEEDS 2023 Reference dataset and S&P Capital IQ Pro.

announced retirements,[21] due to the continued strengthening of these driving forces going forward.

15. While it is not possible to attribute coal EGU retirement decisions to any single factor, several key contributing elements can be identified. First, the outlook for natural gas prices continues to suggest that they will be low relative to coal. Natural gas prices play a twofold role in impacting coal plant economics. As natural gas is a competing fuel to coal, relatively low natural gas prices tend to shift generation away from coal, reducing overall coal EGU revenues. But natural gas-fired EGUs are also the marginal electricity generating unit[22] in a lot of power markets.[23] Since marginal EGUs set the market clearing price of electricity and do so based on their variable costs of production, a lower natural gas price usually leads to lower wholesale electricity prices. As a result, low natural gas prices both reduce coal EGUs' overall output and, by reducing the unit price of electricity, drive down the amount of revenue the coal EGUs can capture per unit of output.

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[21] See Bloomberg NEF, *Sustainable Energy in America 2024 Factbook*, https://bcse.org/images/2024%20Factbook/2024%20BCSE%20BNEF%20Sustainable%20Energy%20in%20America%20Factbook.pdf.

[22] "Economic dispatch," the basic principle that governs operation of nearly all U.S. EGUs, generally determines the mix of generating resources that is used to meet electricity demand. EGUs that cost less to operate are selected—or dispatched—first, followed by progressively more expensive resources until all demand is satisfied. Dispatch is based on the marginal or variable production cost of each plant, which is the incremental charge (also known as the "avoidable cost") that a plant incurs for every additional MWh it generates. The most expensive unit or the last unit to be called is the marginal EGU that sets the price of electricity that is paid to all other EGUs in the market.

[23] See EIA, *In most U.S. regions, 2024 wholesale electricity prices will be similar to 2023* (Jan. 18, 2024), https://www.eia.gov/todayinenergy/detail.php?id=61244.

Between 2008 and 2023 natural gas prices declined by 71% while coal prices increased by 22%.[24] This dynamic is likely to be exacerbated going forward, as natural gas prices are expected to remain low or relatively flat, but coal prices are likely to trend upwards and become more volatile due to suppliers potentially exiting the market in response to dwindling demand for coal.[25]

16. The rapidly falling cost of renewable resources is the second major contributing factor. As I noted earlier, costs of wind and solar new builds have come down by 65% and 83%, respectively, between 2009 and 2023.[26] The outlook is for these costs to continue to drop further through 2030 and beyond.[27] As the full impacts and scope of the tax credits and other benefits available to renewable energy sources under the Inflation Reduction Act (IRA) are fully implemented, it is likely that the cost declines and, therefore, the deployment of wind and solar will accelerate significantly. For example, a major utility in Michigan indicated in a recent rate request proceeding that the tax credit provisions in the IRA caused the LCOEs of wind and solar, in their modeling, to decline by an additional 18% and

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[24] See EIA, *Short-Term Energy Outlook* (Jul. 9, 2024), https://www.eia.gov/outlooks/steo/ (Natural Gas Henry Hub Spot Price; Electric Power Sector Coal Cost).
[25] See Reuters, *US natgas will be cheaper than coal in 2024 for the first time, EIA says* (Apr. 9, 2024), https://www.reuters.com/business/energy/us-natgas-will-be-cheaper-than-coal-2024-first-time-eia-says-2024-04-09/ and Carolinas Resource Plan, *Coal Retirement Analysis*, https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=79d54d2f-50ff-462d-b3fd-7de30dbd3c66.
[26] See note 11.
[27] See NREL, *Utility-Scale PV*, https://atb.nrel.gov/electricity/2023/utility-scale_pv and NREL, *Offshore Wind*, https://atb.nrel.gov/electricity/2023/offshore_wind.

7%, respectively.[28] Further, as indicated earlier, renewable and clean energy policies at the state and local levels will also continue to play important roles in driving increasing adoption of renewable energy going forward.[29] All else being equal, as with natural gas, higher levels of renewable energy on the grid have a similar twofold effect on the economics of coal. Because renewable resources have no marginal cost of electricity production and are accepted on the grid whenever available due largely to their intermittent nature, they reduce both coal EGUs' share of total electricity production and, by shifting the generation supply curve outward,[30] drive market clearing prices of electricity lower.

17. The third major contributing factor to coal EGU retirement decisions is their increasing costs of operation and maintenance, which I also noted earlier. The U.S. coal-fired EGU fleet is old, with an average unit age of about 43 years.[31] As I noted earlier, for each decade of increase in age, ongoing capital expenditure

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[28] See testimony of R. Cejas Goyanes, *DTE Electric Company 2022 IRP*, https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/0688y000004qW9sAAE

[29] See note 10.

[30] Higher amounts of renewable resources, all else being equal, tend to alter the equilibrium point on a generation supply curve where the quantity of electricity supplied matches the quantity of electricity demanded. A generation supply curve is composed of all available EGUs in an electricity market ordered according to their marginal or variable production costs. Due to their zero marginal production cost, renewable resources are clustered near the low end of such a generation supply curve, with all other EGUs coming after them. As more renewable resources become available and are added to the generation supply curve, progressively fewer other EGUs are needed to meet the same level of demand. Stated another way, the additional renewable resources move the equilibrium point on the generation supply curve inward (or the curve outward) to a lower marginal production cost point, which results in a lower clearing price of electricity. See note 22 for additional context and discussion.

[31] Based on analysis of NEEDS 2023 Reference dataset.

requirements tend to increase by an estimated 5%. However, this likely underestimates the actual increase in costs. As average capacity factors of coal-fired EGUs have dropped from over 72% in 2008 to about 42% in 2023, they are likely cycling (i.e., operating at varying load levels) significantly more as a result, which tends to increase the wear and tear of equipment, thereby elevating operational costs and increasing the need for more frequent capital expenditures.

18. Coal-fired EGUs in the U.S. are increasingly uneconomic to operate due to factors and market fundamentals that are independent of the MATS Update Rule. As outlined in this declaration, going forward, the trends underlying these key factors and fundamentals are likely to reinforce each other and accelerate, thereby deteriorating coal EGU economics even further and more quickly. We are likely to see a significant portion of the current fleet retire in the coming years, as a result.

In comparison with the cost impacts of the above key contributing factors to the retirement of coal EGUs, my analysis suggests that the estimated incremental cost of complying with the MATS Update Rule is minimal (less than 0.1% of current costs for most EGUs and greater than 5% for only nine) and is not likely to lead to any additional retirements. The compliance costs are also unlikely to impact utility retail customer rates for most utilities. Regulators who must approve any such rate increases (and boards of publicly owned utilities who must approve investment and expenditure budgets) are increasingly asking about more economic market-based alternative options. Even if some or all of the compliance costs end up included in customer rates, the overall impacts are likely to be negligible, as the approved cost recovery amounts, which are themselves minor compared with overall annual rate increase requests (about 6% relative to the annual average rate increase amounts requested over the last two years by investor-owned utilities in the U.S.), will be further spread over several years through the end of the useful life of the EGUs. And, the impacts, if any, will not be immediate, as the tariff proceedings that utilities must generally undergo to get the rate increases approved typically take more than a year to conclude and finalize.

I declare under penalty of perjury that the foregoing is true and correct.

/s/ Amlan Saha

Executed in Boston, MA, on July 19, 2024.

Attachment A: Curriculum Vitae of Amlan Saha

AMLAN SAHA

PT Strategy & Intelligence, LLC | asaha@ptstrategy.com | +1 617 281 6678

PROFESSIONAL PROFILE

- Accomplished clean energy professional with nearly 20 years of experience leading strategic engagements with large private sector clients and non-governmental organizations
- Skilled commercial strategist with proven track record of collaborating with clients across business lines on complex decarbonization efforts, low carbon economy, and net-zero transition planning
- Lead architect of economy-wide carbon pathways models that energy companies can use to conduct climate scenario analyses consistent with the recommendations of the Taskforce on Climate-related Finance Disclosures (TCFD)

KEY AREAS OF EXPERTISE

- Energy and environmental policy
- Low carbon economy transition (LCET) related economic and financial analysis
- Legislative and regulatory assessment
- Carbon pricing (cap and trade/invest, carbon tax, border adjustment mechanisms, internal carbon pricing, etc.)
- Clean technology investment
- Electricity and energy market development

PROFESSIONAL EXPERIENCE

2024-present **PT Strategy & Intelligence** **Boston, USA**

Senior Advisor and Director

- Provide strategic advice to energy sector clients and non-governmental organizations regarding the design of frameworks for the transition to a low carbon economy, economic and strategic analyses of climate policies, and market development issues.

2022-2023 **ENGIE Impact** **Boston / New York, USA**

Managing Director, Americas

- Co-lead the overall strategy of Engie Impact's decarbonization solutions group for the Americas region.
- Drive growth through strong go-to-market strategies and continuous refinement of Engie Impact's full suite of "strategy to implementation" decarbonization capabilities—from C-suite engagement, identification of value accretive transformation pathways, to sourcing, financing, implementation, and deployment of novel as-a-service approaches for large commercial and industrial customers.
- Provide thought leadership and catalyze conversations to tackle structural barriers to complex decarbonizations that go beyond energy efficiency and electrification measures.
- Develop and manage sector and practice area budgets and profit / loss.

2007-2022 **ERM (Environmental Resources Management)** **Boston, USA**

Partner (2021-2022)

- Attained fast-track promotion to Partner.
- Led ERM's LCET economics and analytics services in North America, coordinated across service lines, and collaborated with other lead ERM Partners to develop commercial strategies that resulted in new business.
- Positioned ERM's LCET economics and analytics team through recruitment and organic growth to be able to provide thought leadership on a wide range of technical and business issues affecting the low carbon economy and net-zero transition.
- Negotiated and served as partner-in-charge for the flagship engagement to design and develop Bank of America's Approach to Zero™ methodology for the bank's transition to net-zero before 2050.
- Oversaw, managed, and coordinated among the high-performing members of ERM's LCET economics and analytics team.

AMLAN SAHA

PT Strategy & Intelligence, LLC | asaha@ptstrategy.com | +1 617 281 6678

Senior Vice President (2018-2021)

- Managed and led M.J. Bradley & Associates' economics and analytics practice and helped prepare and position the service line to become the launchpad and anchor for ERM's LCET economics and analytics offering post-acquisition.
- Expanded significantly the footprint of ERM's strategic LCET economics and analytics services in the financial services sector by co-leading the design and development of the methodology underpinning JPMorgan Chase's commitment to Paris-aligned financing (Carbon Compass^{SM}).
- Grew headcount of the LCET economics and analytics team by more than 20 percent. Provided key inputs in redeveloping and ensuring "fit for purpose" of the onboarding, coaching, and mentoring plans for staff in the LCET team.

Vice President (2012-2018) *(@M.J. Bradley & Associates; acquired by ERM in 2020)*

- Co-managed M.J. Bradley and Associates' economics and analytics practice—identified and positioned M.J. Bradley and Associates in new market regions and launched engagements with new clients.
- Led a team of expert consultants in the design and development of the STate Emission Pathways Tool (STEP Tool), an economy-wide carbon pathways model to examine the impact of policy changes on energy use and emission trajectories.
- Coordinated business development and commercial strategy for the STEP Tool. Closed deals with several US electric utilities to undertake 2-degree scenario analyses that are consistent with recommendations of the Taskforce on Climate-Related Financial Disclosures (TCFD).

Operations Research Analyst (2007-2012) *(@M.J. Bradley & Associates; acquired by ERM in 2020)*

- Conducted strategic policy analyses of U.S. federal energy and environmental legislation and provided advisory services to energy sector clients on regulatory and legislative proceedings in the U.S. Congress.
- Responsible for objective and innovative analysis of economic and public policy issues associated with electricity generation. Advised utilities, regulators, consumers, and market participants within the energy sectors on emissions markets, clean energy policies, project analysis, and regional public policies.
- Developed assessments of company-specific impacts of legislation and provided support to members of the Clean Energy Group in drafting responses to proposed legislation.

2001-2003 **SIEMENS** **Singapore**

Manager (Information Communication Mobile)

- Established a regional center in Singapore for next generation communications systems with a budget of EUR 2.5MM. Implemented the "Balanced Score Card" to manage and measure the performance of the center.

2000-2001 **3UI (Mobile Data Access Company)** **Singapore**

Founder

- Raised USD 1MM from venture funds in Singapore and the United States. Increased headcount from zero to 22 and established alliances in China, Thailand, and Finland.

1998-2000 **IIR (Institute for Infocomm Research – A Natl. Research Lab.)** **Singapore**

Research Engineer (Strategic Research Program)

- Managed the organization's role at the IETF—the Internet standards organization.

AMLAN SAHA

PT Strategy & Intelligence, LLC | asaha@ptstrategy.com | +1 617 281 6678

EDUCATION

2004-2007	**Fletcher School of Law and Diplomacy, Tufts University** Master of Arts in Law and Diplomacy (MALD)	**Boston, USA**
	Harvard Law School Coursework in International Trade Law	**Boston, USA**
	L'Ecole des Hautes Etudes Commerciales (HEC Paris) Master of Business Administration (MBA)	**Paris, France**
1994-1998	**National University of Singapore** Bachelor of Engineering (Electrical Engineering)	**Singapore**

SELECT PUBLICATIONS

- Internal Carbon Pricing: Streamlining Corporate Decarbonization and Climate Risk Management, May 2023
- U.S. Light Truck Electrification: Economic and Jobs Impact Study, November 2021
- Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States, 2008-2021 (published annually)
- RGGI Expansion - Implications of Additional States Joining RGGI, August 2020
- Colorado's Climate Action Plan Emission Targets: Illustrative Strategies and GHG Abatement Potentials, February 2020
- The Role of Renewable Biofuels in a Low Carbon Economy, February 2020
- Served on advisory committee for the Carbon Free Boston Working Group supporting the development of an analytical framework for the City of Boston to achieve its goal of being carbon-neutral by 2050, 2019
- Decarbonizing Transportation: The Benefits and Costs of a Clean Transportation System in the Northeast and MidAtlantic Region, October 2018
- The War on Climate Change: Hubris to Realism, Summer 2015
- Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability, August 2010
- Electricity Rate Impact Analysis of the American Clean Energy and Security Act (H.R. 2454), July 2009

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

State of North Dakota, et al, Petitioners, v. **United States Environmental Protection Agency, et al.,** Respondents.	Case No. 24-1119 (and consolidated cases)

DECLARATION OF DOUGLAS P. SCOTT, CHAIRMAN OF THE ILLINOIS COMMERCE COMISSION

I, Douglas P. Scott, declare as follows:

1. I am Chairman of the Illinois Commerce Commission ("ICC") and submit this declaration in support of State Intervenors' opposition to the motions to stay the Environmental Protection Agency's ("EPA") final rule entitled National Emissions Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review ("RTR Rule"), 89 Fed. Reg. 38508 (May 7, 2024), which strengthens the nation-wide hazardous-air-pollutant emissions limits of the 2012 Mercury and Air Toxics Standards ("MATS") Rule for coal- and oil-fired power plants.

Personal Background and Qualifications

2. I was appointed to fill an unexpired term as Chairman of the ICC on June 17, 2023, and was reappointed on January 19, 2024. I previously served as Chairman of the ICC from 2011 to 2015. The ICC is responsible for overseeing the provision of adequate, reliable, efficient and safe utility services at the least possible cost to Illinois citizens served by electric, natural gas, and other telecommunications, water and sewer public utility companies. Previously, I was Energy Systems Vice President for the Great Plains Institute, where I worked on decarbonization efforts with states and utilities, including by advising the Illinois Governor's Office from 2020 to 2023. I also served as the Director of the Illinois Environmental Protection Agency from 2005 to 2011. I hold a Bachelor of Arts with honors from the University of Tulsa and a Juris Doctorate with honors from Marquette University.

The RTR Rule

3. EPA's RTR Rule sets forth new limits for non-mercury hazardous air pollutant ("HAP") metals through a lower emission standard for filterable particulate matter ("fPM"), a surrogate for non-mercury metals HAPs and requiring compliance be demonstrated by

using a PM continuous emissions monitoring system ("CEMS").[1] EPA set a three-year compliance timeline for the Rule, with an optional one-year extension through 2028.[2]

Illinois Is Already Reducing Pollution from Fossil-Fueled Power Plants While Maintaining Grid Reliability and Supporting Communities Dependent on Those Facilities.

4. At the state-level, Illinois has long worked to reduce pollution, including emissions of mercury and particulate matter, from coal-fired and other fossil-fueled power plants. For example, since 2009, Illinois has limited mercury emissions from coal-fired power plants to a level significantly lower than the MATS Rule currently requires.[3]

5. More recently, Illinois has set a goal of 100% clean energy by 2050. To meet this goal, in 2021 Illinois enacted the Climate and Equitable Jobs Act ("CEJA").[4] CEJA requires that fossil fuel-fired power plants in Illinois achieve zero criteria pollutant emissions—including

[1] 89 Fed. Reg. at 38510.
[2] *Id.* at 38526, 38564; *see also* 42 U.S.C. § 7412(i)(3)(B),(A).
[3] *Compare* Ill. Admin. Code tit. 35 § 225.230(A)(1)(a) (limiting coal-fired power plant mercury emissions to 0.008 lb/GW-hr, or 0.6 lb/TBtu) (eff. July 2009) *with* 89 Fed. Reg. at 38510 (limiting lignite-coal-fired power plant mercury emissions plants to 1.2 lb/TBtu).
[4] Illinois P.A. 102-0662, *available at* https://www.ilga.gov/legislation/publicacts/102/PDF/102-0662.pdf.

particulate matter emissions—and zero greenhouse gas emissions. Private coal-fired and oil-fired electric generating units must reach zero emissions by January 1, 2030, municipal coal-fired plants by December 31, 2045, and natural gas-fired units by 2045. CEJA also requires that municipal coal plants achieve a 45% emissions reduction by 2035, or face retirement by 2038. CEJA also caps emissions at most coal and gas-fired plants at current levels.[5]

6. In order to prevent any impacts to grid reliability from implementing CEJA, Regional Transmission Organizations ("RTOs")[6] PJM and MISO negotiated with Illinois officials to establish exemptions from these limits in the event of reliability incidents. Such exemptions are at the discretion of the RTOs.

7. Because energy in Illinois is a competitive market, Illinois cannot rely on integrated resource planning available in other states to maintain reliability and affordability while it works toward meeting its power-plant-pollution-reduction goals.[7] Accordingly, as part of CEJA, the

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[5] 415 ILCS 5/9.15(k-5).
[6] An RTO is an electric power transmission system operator that coordinates, controls, and monitors a multi-state electric grid.
[7] In general, states that use the Integrated Resource Plan approach requires utilities that operate in the state to create a long-term forecast

ICC and other State agencies are required to submit a report on reliability to the General Assembly every five years, with the first such report due by the end of 2025 to ensure that reliability and affordability are protected.

8. Another important way that Illinois will ensure energy reliability and affordability is through aligning incentives for a reliable zero emissions future, including by providing financial assurances to Illinois' nuclear power plants when necessary to ensure their continued operation through 2027 and relying on the state's well-established incentives to encourage incorporation of community solar, rooftop solar, utility scale wind, and solar into the grid and the conversion of coal plants and other brownfield sites into renewable energy and/or storage facilities. Illinois has also significantly increased its commitment to energy efficiency to curb demand and ensure energy reliability.

9. Further, on May 30, 2024, the ICC adopted the Renewable Energy Access Plan ("REAP") to foresee where transmission will be needed in the state, and to support adoption of grid-enhancing

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of energy demand, explain what resources will be necessary to meet that demand, and describe the least-cost approach to acquiring those resources.

technologies.[8] This plan will expedite transmission and prepare the State for additional energy production coming online. This will strengthen our electricity interconnection system to ensure that new zero-emitting energy sources can more quickly connect to our power grid.

10. Finally, because Illinois is focused on a just transition for communities and individuals who have economically relied on coal-fired power plants or coal mines, CEJA also provides support to displaced energy workers. The law provides up to $40 million annually in grants for communities with closing or closed power plants or coal mines to address economic and social impacts from the energy transition, including replacement property taxes, and financial incentives for clean energy investment in those communities.[9]

11. By carefully implementing these protective measures, Illinois intends to maintain reliability and affordability within its electric sector and support communities that have been economically dependent on fossil-fueled power plants while also meeting our ambitious power-plant

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[8] ICC, ILLINOIS RENEWABLE ENERGY ACCESS PLAN 66-88 (May 30, 2024), https://icc.illinois.gov/api/web-management/documents/downloads/public/2024-05-30%20REAP.pdf.
[9] 20 ILCS 735/10-20.

emissions reduction goals and the ongoing pollution limits of the 2012 MATS Rule and the current RTR Rule.

I declare under penalty of perjury that the foregoing is true and correct.

Executed in Chicago, IL on August 19, 2024.

Douglas P. Scott

Douglas Scott
Chairman

ORAL ARGUMENT NOT YET SCHEDULED

IN THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

State of North Dakota, et al., Petitioners, **v.** **United States Environmental Protection Agency,** Respondent.	Case No. 24-1119 (and consolidated cases)

DECLARATION OF C. MARK SMITH, OFFICE OF RESEARCH AND STANDARDS, MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

I, C. Mark Smith, state and declare as follows,

I. Purpose of this Declaration

1. I am the Director of the Office of Research and Standards ("ORS") within the Massachusetts Department of Environmental Protection ("MassDEP"). That office provides scientific expertise to MassDEP in environmental health, toxicology, standard setting, ecological and human health risk assessment, chemistry and statistics. I also manage the scientific efforts of the Wall Experiment Station, Division of Environmental Laboratory Services ("WES-DELS"). In this capacity, I am responsible for overseeing MassDEP's monitoring of fish tissue mercury concentrations across Massachusetts and its involvement in a

multi-agency effort to assess that contamination in order to protect the Commonwealth's public health and natural resources.

2. I submit this declaration on behalf of the Commonwealth of Massachusetts in support of the State and Local Government parties' Motion to Intervene as Respondents in *North Dakota v. U.S. Environmental Protection Agency*, U.S. Court of Appeals for the District of Columbia Circuit, No. 24-1119 (and consolidated cases), which seeks review of the final agency action of the U.S. Environmental Protection Agency ("EPA") entitled *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*, 89 Fed. Reg. 38,508 (May 7, 2024) ("MATS RTR"). That final action, taken pursuant to section 112 of the Clean Air Act, 42 U.S.C. 7412(d)(6), strengthens the Mercury and Air Toxics Standards ("MATS"), 77 Fed. Reg. 9304 (Feb. 12, 2012), that limit power-plant emissions of mercury and other hazardous non-mercury metals. As I explain below, those federal standards have been essential to protecting the Commonwealth's public health and natural resources from the dangers of out-of-state power-plant mercury emissions.

II. Experience and Qualifications

3. I have over 35 years of experience in the field of environmental science, policy, and management. I have expertise in the fields of toxicology,

epidemiology, environmental science, exposure assessment, and environmental policy and have published in these fields.

4. I hold a Ph.D. in Pharmacology and Toxicology from Harvard University and an M.S. in Environmental Management from the Harvard School of Public Health. I have extensive state, interstate, national, and international experience related to mercury impacts and policy. I served as the Co-Chair of the New England Governors ("NEG") and Eastern Canadian Premiers ("ECP") Mercury Task Force, charged with overseeing implementation of the 1998 NEG-ECP Mercury Action Plan; represented the Commonwealth in the development and negotiation of the NEG-ECP Mercury Action Plan; played lead roles in the development and implementation of the Massachusetts Zero Mercury Strategy; co-founded and chaired the Environmental Council of States ("ECOS") Quicksilver Caucus, a national organization comprised of a group of interstate organizations focused on mercury issues; served as one of two state representative in the development and implementation of the trilateral North American Regional Action Plan ("NARAP") for mercury; and, have published on mercury science and policy.

III. Mercury Contamination is Widespread in Massachusetts Freshwater Waterbodies and Fish.

5. Mercury is a potent toxin that causes adverse effects to the neurological, immune, kidney, and cardiovascular systems of humans and similar

harms to wildlife.[1] The brains and developing nervous systems of fetuses and children are especially vulnerable to mercury exposure, even at low levels.[2] Because consumption of mercury-contaminated fish is the primary source of human exposure to mercury, for decades MassDEP, in coordination with the Massachusetts Department of Public Health (DPH) and Department of Fish and Game, has been assessing the levels of mercury contamination in the Commonwealth's freshwater fish in order to evaluate the extent of mercury contamination in Massachusetts' waters and reduce the health risks to the public from consumption of mercury-contaminated fish.

6. While there are natural sources of mercury, anthropogenic sources are the most significant. Atmospheric deposition of mercury emitted to the air by anthropogenic sources—in particular, coal-fired power plants, which until recently

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[1] *See, e.g.*, D.C. Evers et al., *A Synthesis of Patterns of Environmental Mercury Inputs, Exposure and Effects in New York State*, 29(10) ECOTOXICOLOGY 1565, 1577-79 (2020), https://pubmed.ncbi.nlm.nih.gov/33170395/; Philippe Grandjean et al., *Adverse Effects of Methylmercury: Environmental Health Research Implications*, 118(8) ENV'T HEALTH PERSP. 1137, 1140-41 (2010), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2920086/pdf/ehp-0901757.pdf.

[2] *See, e.g.*, Sara T.C. Orenstein et al., *Prenatal Organochlorine and Methylmercury Exposure and Memory and Learning in School-Age Children in Communities Near the New Bedford Harbor Superfund Site, Massachusetts*, 122(11) ENV'T HEALTH PERSP. 1253, 1256, 1257-58 (2014), https://ehp.niehs.nih.gov/doi/10.1289/ehp.1307804; Stephanie Bose-O'Reilly et al., *Mercury Exposure and Children's Health*, 40(8) CURRENT PROBS. IN PEDIATRIC & ADOLESCENT HEALTH CARE 186, 186 (2010), https://doi.org/10.1016/j.cppeds.2010.07.002.

were the largest regulated source of human-caused mercury emissions in the United States[3]—is responsible for the majority of mercury contamination in the Commonwealth.[4] Once released to the air, mercury is deposited into waterbodies through dry and wet deposition (precipitation) and transformed into methylmercury by microorganisms. Methylmercury is a particularly toxic and bioavailable form of mercury that bioaccumulates in fish as it moves up the food chain, creating a risk to humans and wildlife who consume such fish.

7. Mercury contamination is a serious problem in Massachusetts. Currently, 205 waterbodies have been listed by Massachusetts as impaired due to mercury contamination, meaning that, as a result of that contamination, they are not able to support designated uses, such as fishing and fish consumption. Those waterbodies include (1) 131 "category 5" waterbodies for which the

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[3] In 2020, annual mercury emissions from electric arc furnaces (3.8 tons per year) surpassed annual mercury emissions from coal-fired power plants (3.6 tons per year). U.S. Env't Prot. Agency, *2020 National Emissions Inventory Technical Support Document: Overview* 2-19, 2-24 to 2-26, Tbl. 2-10 (2023), https://www.epa.gov/system/files/documents/2023-01/NEI2020_TSD_Section2_Overview_0.pdf. Previously, in 2014, coal-fired power plants were the largest emitter of mercury (22.9 tons). U.S. Env't Prot. Agency, *2014 National Emissions Inventory, version 2: Technical Support Document* 2-23, 2-28, Tbl. 2-14 (2018),https://www.epa.gov/sites/default/files/2018-07/documents/nei2014v2_tsd_05jul2018.pdf.

[4] Northeast States for Coordinated Air Use Mgmt. ("NESCAUM"), *Sources of Mercury Deposition in the Northeast United States* 1, 3 (March 2008) ("NESCAUM 2008 Report"), http://www.nescaum.org/documents/nescaum-sources-of-hg-depo-in-northeast_2008-final.pdf/.

Commonwealth must develop Total Maximum Daily Loads ("TMDLs"), or mercury "budgets," pursuant to Federal Clean Water Act section 303(d)(1), in order to reduce the mercury contamination to a level that will allow for fishing and fish consumption, and (2) 74 "category 4a" waterbodies for which the Commonwealth has already developed mercury TMDLs. *See* 33 U.S.C. § 1313(d)(1) (requiring TMDLs for impaired waters).[5]

8. Pursuant to a Memorandum of Understanding between MassDEP, the DPH, and the Department of Fish and Game, ORS and WES-DELS are primarily responsible for collecting and analyzing freshwater fish tissue samples from lakes across the Commonwealth for mercury through their Fish Mercury Long Term Monitoring Research Program. That testing data is then used by DPH to develop fish consumption advisories for those waterbodies.

9. MassDEP began monitoring mercury levels in fish in 1994 and, since 2001, has sampled a subset of lakes over time during the spring. In order to ensure

[5] Commonwealth of Mass. Exec. Off. of Energy & Env't Aff., *Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle* (CN 568.1) 84-105, 121-214 (May 2023) (identifying all "category 4a" waters for which TMDLs have been developed and the impairment-causing pollutant(s) and all "category 5" waters for which TMDLs must be developed and the impairment-causing pollutant(s)), https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-2022-reporting-cycle/download. These numbers do not reflect hundreds of additional waters that have not yet been assessed pursuant to section 303(d) for impairment by mercury or other pollutants. *See id.* at 8, 64-83.

that the sampled lakes are representative of those likely to be used by recreational fishers, each of the lakes is typical of those within a particular area of the state, based on geographic location and size, and supports two species of popular sportfish, largemouth bass and yellow perch. Not only are those species often caught and eaten by recreational fishers, they are also good indicators of mercury levels in other species.[6] MassDEP expends significant resources to monitor fish mercury levels. In recent years, MassDEP has incurred annual contractor expenses of approximately $30,000 for fish sampling services. In addition, several MassDEP employees devote a portion of their work time to the monitoring program. These efforts include management of fish tissue samples, completion of laboratory analyses, maintaining analytical equipment, designing and implementing data management systems, and designing and completing statistical analyses and reports. In recent years MassDEP estimates that these staff efforts have totaled between one-quarter and one-half of a full-time equivalent employee annually. Atmospheric deposition of mercury, including that attributable to U.S. coal-fired power plants, was a significant factor in the establishment of MassDEP's monitoring program.

[6] MassDEP ORS, *Fish Mercury Long Term Monitoring Annual Data Reports – Methods* (July 2010), https://www.mass.gov/doc/methods-for-annual-data-reports-fish-mercury-long-term-monitoring-0/download.

10. Since the inception of the fish mercury monitoring program in 1994, Massachusetts has tested thousands of fish tissue samples for mercury. Many of those samples have shown mercury concentrations greater than 0.3 mg Hg/kg wet weight, EPA's fish tissue criterion for the protection of human health,[7] and average fish mercury concentrations in many freshwater bodies have exceeded the DPH criteria for fish consumption for one or more species.[8] As a result, DPH has issued a statewide advisory warning pregnant women and children to avoid eating certain types of fish due to mercury contamination from all waterbodies in Massachusetts, as well as separate mercury-related advisories for 192 individual Massachusetts waterbodies in which fish tissue has been tested.[9]

IV. Massachusetts Has Made Substantial Efforts to Reduce Mercury Contamination of Its Waters and Natural Resources through In-State Controls and Regional Cooperation.

11. Massachusetts has worked for decades to reduce the serious mercury contamination in its waterbodies and natural resources. In 1998, Massachusetts joined with the other New England states and the Eastern Canadian Provinces to adopt a Regional Mercury Action Plan, with the goal of reducing by 50 percent

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[7] *See* U.S. EPA, *Water Quality Criterion for the Protection of Human Health: Methylmercury* xvi (Jan. 2001), https://www.epa.gov/sites/production/files/2020-01/documents/methylmercury-criterion-2001.pdf.
[8] Mass. DPH, *Freshwater Fish Consumption Advisory List* (May 2024), https://www.mass.gov/doc/public-health-freshwater-fish-consumption-advisories-2024-0/download.
[9] *See id.*

anthropogenic mercury releases within the region by 2003.[10] In 2001, the Commonwealth developed a Zero Mercury Strategy, a coordinated, multi-agency, multi-media strategy for eliminating the use and release of anthropogenic mercury in Massachusetts through reduction and control of mercury sources, outreach and education, and research and monitoring.[11] That strategy set an additional goal of reducing in-state mercury emissions by 75 percent in 2010.[12]

12. As part of the Zero Mercury Strategy, the Commonwealth established strict mercury pollution control targets and requirements on in-state municipal solid waste incinerators, medical waste incinerators, and coal-fired power plants, all of which were significant sources of mercury air emissions.[13] It similarly put in place regulations limiting the discharge of mercury attributable to the dental sector, which had been a significant contributor of mercury to both solid waste and wastewater.[14] State legislation and MassDEP regulations were also adopted

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[10] Comm. on Env't of Conf. of N. Eng. Governors & E. Canadian Premiers, *Mercury Action Plan 1998* 7 (June 1998), https://www.mass.gov/doc/new-england-governorseastern-canadian-premiers-mercury-action-plan/download.
[11] Mass. Mercury Task Force, *Massachusetts Zero Mercury Strategy* 5 (2000), https://www.mass.gov/doc/massachusetts-zero-mercury-strategy/download.
[12] *See id.*
[13] *See* 310 Mass. Code Regs. §§ 7.08(2) (solid waste incinerators), 7.29(5)(a)3. (coal-fired power plants).
[14] *See* 310 Mass. Code Regs. § 73.00 *et seq.*

prohibiting many unnecessary uses of mercury and requiring enhanced mercury recycling programs state-wide.[15]

13. By 2008, Massachusetts had reduced in-state mercury air emissions by over 91 percent, as compared to 1996 levels, exceeding the goals of the Zero Mercury Strategy.[16] Moreover, MassDEP's monitoring data documented significant declines in fish tissue mercury levels statewide—approximately 13 percent for largemouth bass and 19 percent for yellow perch—between the years 1999 and 2011, which encompass the period during which the significant declines in statewide mercury air emissions occurred.[17] Even greater reductions, approximately 44 percent and 43 percent, for the two species noted above respectively, occurred in the Merrimack Valley, an area in northeast Massachusetts, which, prior to implementation of the Zero Mercury Strategy, had been a mercury emission "hotspot" containing a large number of municipal solid waste and medical waste incinerators.[18]

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[15] *See* Mass. Gen. Laws, c. 21H, §§ 6a-6n (Mercury Management Act).
[16] NESCAUM, *Massachusetts State Anthropogenic Mercury Emissions Inventory Update* 1-2 (Dec. 20, 2011), https://www.nescaum.org/documents/ma-hg-inventory-update-201112-final.pdf.
[17] *See* Michael S. Hutcheson et al., *Temporal and Spatial Trends in Freshwater Fish Tissue Mercury Concentrations Associated with Mercury Emissions Reductions*, 48 ENV'T. SCI. & TECH. 2193, 2193 (2014), https://www.ncbi.nlm.nih.gov/pubmed/24494622.
[18] *See id.* at 2196, Tbl. 1.

14. At the same time, however, the monitoring program showed, and continues to show, that mercury levels have remained too high in many waterbodies to allow for unrestricted human consumption, requiring fish consumption advisories to remain in place across the Commonwealth. In 46 of the lakes monitored by MassDEP, fish mercury levels are so high that they are subject to individual mercury-based fish consumption advisories. At least five of those forty-six lakes are located on Commonwealth-owned land.

V. The Federal Controls on Out-of-State Power-Plant Mercury Required by the MATS Rule Are Essential to Making Massachusetts Waters Safe from Mercury Pollution.

15. Mercury pollution emitted from sources outside of Massachusetts, including from upwind states that lack the strict in-state mercury emission limitations that Massachusetts has put in place, is carried by the wind across state borders and is a significant source of the mercury loading to the Commonwealth's waterbodies.[19] As a result, in addition to implementing the rigorous in-state mercury control measures, Massachusetts has worked with other states in the region and has long advocated for strong federal standards to address mercury pollution emitted from uncontrolled sources in upwind states.

16. In 2007, Massachusetts, along with the New England states and New York, petitioned EPA to establish a Northeast Regional Mercury TMDL pursuant

[19] NESCAUM 2008 Report, *supra* note 4, at 1.

to section 303(d)(1) of the Federal Clean Water Act. *See* 33 U.S.C. § 1313(d)(1). That TMDL, approved by EPA, sets a mercury budget that is projected to reduce mercury contamination in the region's waters to levels that will allow for the lifting of fish consumption advisories.[20] In order the reach the targeted safe mercury levels, the TMDL concludes that it will be necessary to reduce deposition of anthropogenic atmospheric mercury in the TMDL region by 98 percent, which will require "significant reductions from upwind out-of-region sources, primarily coal-fired power plants."[21] Indeed, modelling undertaken to support achievement of the TMDL reductions process showed that mercury emissions from sources in states immediately upwind of the TMDL region were responsible for 40 percent of the domestic U.S. contribution to the region.[22]

17. Many of those most immediately upwind states identified during the TMDL process as contributing to that load, including Pennsylvania, Ohio, and West Virginia, continue to have coal-fired power plants operating within their

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[20] Conn. Dep't of Env't Prot., Me. Dep't of Env't Prot., Mass. Dept' of Env't Prot., N.H. Dep't of Env't Serv., N.Y. Dep't of Env't Conservation, R.I. Dep't of Env't Mgmt., Vt. Dep't of Env't Conservation, New England Interstate Water Pollution Control Comm'n, *Northeast Regional Mercury Total Maximum Daily Load* 44 (Oct. 24, 2007) ("Northeast Regional Mercury TMDL"), https://www.mass.gov/doc/final-northeast-regional-mercury-tmdl-0/download.

[21] *Id.* at 33, 39, 44.

[22] NESCAUM 2008 Report, *supra* note 4, at 1.

borders.[23] As a result, the federal mercury emissions limits mandated by MATS have been, and continue to be, essential to reducing the contribution of out-of-state power-plant emissions to the mercury load in Massachusetts and the TMDL region as a whole. And while the MATS RTR will require more stringent mercury emission limits only on power plants that burn lignite coal, which are primarily located in Texas and North Dakota,[24] the TMDL process also identified mercury emissions from those states as contributing, albeit to a more limited degree, to the mercury load in the region.[25] It should be noted, however, that the contribution percentages identified as part of the TMDL process likely underestimate the current contribution from upwind states because the modeling predates the implementation of state-based mercury emission limits on waste incinerators and power plants in the TMDL region, as well as in New Jersey, which substantially reduced those in-region emissions.[26]

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[23] *Id.* at 18, 19, Tbl. 6-1; U.S. Energy Info. Admin., Energy Atlas: U.S. Operable Power Plants, https://eia.maps.arcgis.com/apps/mapviewer/index.html?layers=bf5c5110b1b944d299bb683cdbd02d2a (showing locations of operable coal-fired power plants in the U.S.).

[24] 89 Fed. Reg. 38,508, 38,537, n.65 (May 7, 2024); 88 Fed. Reg. 24,854, 24,876, Tbl. 5 (Apr. 24, 2023).

[25] NESCAUM 2008 Report, *supra* note 4, at 18, Tbl. 6-1.

[26] *See* Susannah King et al., *Reducing Mercury in the Northeast United States*, 10 & Fig. 1 (May 2008), http://www.nescaum.org/documents/reducing-mercury-in-the-northeast-united-states/ne-mercury-progress-em-200805.pdf (mercury emissions from municipal waste incinerators and medical waste incinerators in

18. Further, because reductions in mercury air emissions have been shown to produce relatively rapid decreases in mercury levels in affected waterbodies and fish,[27] mercury emissions limits on large out-of-state U.S. sources, such as those required for coal-fired plants by MATS since its 2015 compliance date, have likely reduced mercury deposition in Massachusetts waterbodies and contamination of freshwater fish. In this way, the MATS mercury emissions limits have likely reduced adverse effects on the environment, public health, and recreational fisheries in Massachusetts, and have complemented the substantial investment the Commonwealth has made over the last decades to reduce that contamination.

I declare that to the best of my knowledge, under the penalty of perjury under the laws of the United States, that the foregoing is true and correct.

New England, New York, and New Jersey declined from 15,600 lbs. to 2,058 lbs. between 1998 and 2002).

[27] Cheng-Shiuan Lee et al., *Declining Mercury Concentrations in Bluefin Tuna Reflect Reduced Emissions to the North Atlantic Ocean*, 50(23) SCIENCE & TECH. 12,825, 12,829-30 (2016), https://pubs.acs.org/doi/10.1021/acs.est.6b04328; Ford A. Cross et al., *Decadal Declines of Mercury in Adult Bluefish (1972-2011) from the Mid-Atlantic Coast of the U.S.A.*, ENVTL. SCI. TECH. 9064-72 (2015); *see also* Brian Bienkowski, *Cleaner Bluefish Suggest Coal Rules Work*, SCIENTIFIC AMERICAN (Jul. 20, 2015), http://www.scientificamerican.com/article/cleaner-bluefish-suggest-coal-rules-work/; Hutcheson (2014), *supra* note 17, at 2198.

Executed on June 4, 2024, at Winchester, Massachusetts.

C. Mark Smith

DECLARATION OF JAMES E. STAUDT, PH.D., CFA

I, James E. Staudt, declare under penalty of perjury that the following is true to the best of my knowledge, information and belief:

2. I am the owner and president of Andover Technology Partners (ATP), a consulting business that commenced operation in 1997. I am an engineer with a Chartered Financial Analyst (CFA) designation and decades of experience in all aspects of energy and air pollution control in the electric generating unit (EGU) sector, as reflected in my CV attached hereto as Attachment 1. My graduate studies at MIT included research in coal combustion and turbomachinery design. Over the course of my career, I have personally developed, designed, supplied, commissioned, and advised on air pollution control technology utilized in a variety of industrial sectors, but especially coal-fired power plants. I have written numerous publications, reports for clients, and other documents on emissions control technology for various industrial applications. I have testified in three federal courts as an expert on the cost, installation (including scheduling and planning) and capabilities of emissions control technology. I have also testified in several arbitration hearings and public hearings on the same. I have also published reports, affidavits and other documents on the engineering and economic factors that impact the deployment of air pollution controls and the resources and time needed to meet regulatory requirements. A list of my publications is included in Attachment 1.

3. As a consultant, I have also advised facility owners, state and federal agencies, and suppliers of emissions control technology on the technical performance, cost, and application of emissions control technology to both non-EGU and EGU facilities. My work contributed directly to Illinois'

landmark 2006 mercury (Hg) control rule and multi-pollutant standards for coal-fired power plants. I received a 2007 US Environmental Protection Agency (US EPA) Science and Technology Achievement Award for work performed with US EPA scientists and engineers that directly relates to Hg and air toxics control from coal-fired power plants. I have published an *ex post* analysis of the costs to comply with the 2012 Mercury and Air Toxics Standards (MATS) rule that was submitted with a declaration to the United States Court of Appeals for the District of Columbia Circuit in 2015. I have also published analysis of the 2023 proposed MATS revision.[1]

4. With this background, I offer the following opinions regarding US EPA's Final Rule - National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review (the "MATS Update Rule"), in response to the motion that have been filed to stay the Rule.[2]

EPA'S PROJECTED UPGRADES FOR CONTROLS ARE FEASIBLE WITHIN THE COMPLIANCE PERIOD, WITH THE MAJORITY OF RESOURCE COMMITMENTS NOT REQUIRED UNTIL A PERIOD OF TIME LIKELY AFTER THE END OF LITIGATION OVER THE RULE (ESTIMATED FOR THIS ANALYSIS AS ROUGHLY SUMMER 2026).

5. The rule provides three years from the effective date of July 8, 2024, to comply, with a possible fourth-year extension from the permitting authority. EPA also provided a three-year compliance timeline (with a possible fourth year extension) in the 2012 MATS rule, which involved control of more pollutants and many more impacted units than the new MATS Update Rule.

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[1] Staudt, J., *Assessment of Potential Revisions to the Mercury and Air Toxics Standards, for Center for Applied Environmental Law and Policy*, June 15, 2023, available at: www.andovertechnology.com/articles-archive.
[2] 89 Fed. Reg. 38508 (May 7, 2024).

"The 2012 MATS Final Rule was ultimately implemented over the 2015-2016 timeframe without challenges to grid reliability."[3] In the following paragraphs I will discuss the reasons why the time period for compliance with this Rule is more than adequate.

A. The equipment can be installed within the timeframe permitted by the Rule.

6. The vast majority of units are already in compliance with the Rule and will not require any modifications to their equipment. Therefore, very few units are expected to require modifications. In this final rule, EPA forecast 33 cases of expected upgrades to reduce emissions of filterable particulate matter (fPM).[4] This is consistent with the findings of my independent analysis of the rule for ATP. In 2023, ATP published a report that analyzed the proposed rule.[5] In that report, ATP determined that for a fPM emission limit of 0.010 lb/MMBtu, 34 units might require a change to fPM equipment, ranging from upgrades to electrostatic precipitators (ESPs), to filter media upgrades, and in only two cases, possibly a new baghouse. For both estimates this is a small fraction of the 296 coal units projected to be in operation in 2028. All of these equipment installations can be performed well within the allotted time of three years or four years (with the extension) from the effective date of the rule, July 8, 2024. I have reviewed both the resources and timeline for installation of various control technologies,

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[3] 89 Fed. Reg at 38519.
[4] 89 Fed. Reg. at 38522.
[5] Staudt, J., *Assessment of Potential Revisions to the Mercury and Air Toxics Standards, for Center for Applied Environmental Law and Policy* (June 15, 2023), available at: www.andovertechnology.com/articles-archive.

including technologies impacted by this rule.[6] Many of these equipment changes, such as media upgrades or more modest ESP upgrades, only require a few months to perform. More complex ESP upgrades may require up to 18 months or so. A new baghouse can be installed in around two years from engineering through construction,[7] a year less than the default compliance timeline and about half of the time available if an extension is permitted. Therefore, the rule allows more than enough time for even the most complex installations. Continuous emissions monitoring systems for fPM (PM CEMS) can be fully installed in well below a year, typically around six months from start to finish.

7. Additional Hg controls are needed only on some lignite-fired units. EPA identified 22 lignite units that may need to make changes to achieve the new Hg limit of 1.2 lb/TBtu, and this estimate too is consistent with my 2023 analysis for ATP. For most of these units, compliance will entail increasing activated carbon injection rates or changing fuel additives or scrubber chemicals. Any equipment changes necessary to accommodate these modifications are relatively minor, at most requiring changes in blowers, carbon metering valves, or larger sorbent storage vessels. All of these changes can be performed well within a year.

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[6] *See* Staudt, J., "Engineering and Economic Factors Affecting the Installation of Control Technologies– An Update", for US EPA Clean Air Markets Division, December 15, 2011; "Engineering and Economic Factors Affecting the Installation of Control Technologies for Multipollutant Strategies", EPA-600/R-02/073, October 2002. ATP was a key contributor to this report.

[7] Sargent & Lundy, "IPM Model – Updates to Cost and Performance for APC Technologies Particulate Control Cost Development Methodology", Final, April 2017, Project 13527-001, page 10. The Presque Isle Power Plant baghouse installation took under two years. *See* Staudt, J., "Engineering and Economic Factors Affecting the Installation of Control Technologies– An Update", for US EPA Clean Air Markets Division, December 15, 2011, page 32.

B. The timeline for installing the controls is reasonable given manufacturing and technology availability and supply chain factors.

8. As I will demonstrate in the following paragraphs, the level of effort required under this Rule is very small compared to the effort required to comply with prior clean air rules. The prior rules had similar timelines but required a much greater effort from industry, and I therefore do not envision there being a significant challenge for suppliers. I also do not envision a significant reliability or availability impact to the coal fleet in light of the small portion of the fleet that is impacted and the generally modest effort needed for the affected units. The modest additional demand for equipment will be primarily for standard equipment used in material handling. The only specialized equipment is filter bag material, and the increase in demand for filter bag material will be small compared to the total supply of filter bag material. Attachment 1 to the Technical Memorandum[8] from the proposed rule shows those EGUs that EPA projected would need to make changes to comply with the updated MATS rule. Of the 263 units, 132 units were already equipped with baghouses without the MATS Update Rule. EPA only forecast two additional baghouses as a result of the updated MATS rule, which is consistent with ATP's 2023 estimate. Filter media upgrades were forecast to be needed by 11 units in ATP's 2023 forecast and 8 units for EPA's forecast provided in the proposed rule. EPA forecast 2 filter bag upgrades and 6 units that would increase standard bag replacement frequency. As a result, whatever increase in filter media is prompted by the

[8] Attachment 1, EPA-HQ-PAR-2018-0794-6919_attachment_1, to 2024 Update to the 2023 Proposed Technology Review for the Coal- and Oil-Fired EGU Source Category (2024 Technical Memo).

rule is well within the capabilities of the industry to supply filter bag material.

9. Supply of activated carbon is more than adequate to address the expected increase in demand for activated carbon resulting from the rule because this impacts only a few units. EPA identified 22 lignite fired units that will need to make modifications to reduce Hg emissions. Currently, hundreds of coal units utilize activated carbon injection, and especially the advanced sorbents that have been developed in the years since the 2012 MATS rule to address situations like higher SO_3 levels, use of trona for dry sorbent injection (DSI), and higher activities for lower treatment rates.[9] Carbons to address elevated SO_3 levels were developed not only to address situations with lignite units, but also for units using bituminous coals or units using Powder River Basin coals that have SO_3 flue gas conditioning. So, these activated carbons are already widely used. In fact, these advanced carbons have become standard due to the typically lower treatment rates offered compared to the older carbon types that were available in 2012. So, this constitutes a very modest impact on activated carbon demand. The supply of these carbons is more than adequate to address the increased demand from the rule.

C. There will be no shortage of vendors and skilled labor.

10. I have personally been involved in the deployment of air pollution control technology and have written several reports for US EPA on resources needed for installation of air pollution control equipment.

11. Vendors will be available for this Rule. There are multiple vendors for all of the equipment that will be deployed to comply with this rule. These are all

[9] Staudt, J., *Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants, for* Center for Applied Environmental Law and Policy (CAELP), August 19, 2021, pages 47-53.

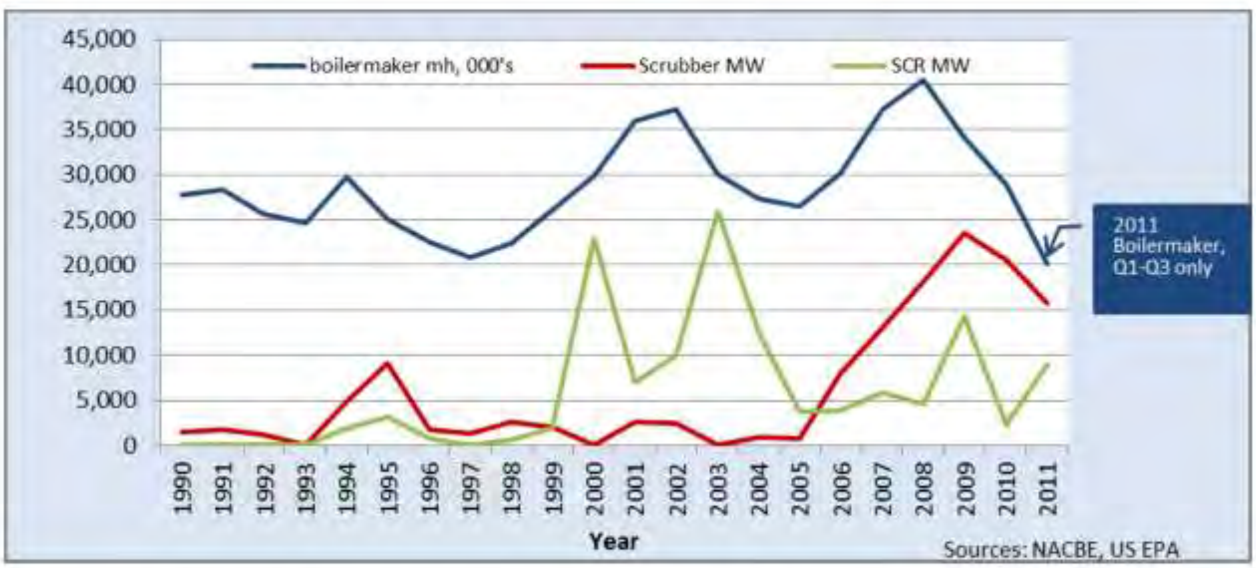
experienced vendors that supported the industry with meeting the 2012 MATS rule requirements that impacted all coal units with control requirements for Hg, non-Hg metals, and acid gases. In contrast to the 2012 MATS rule that impacted hundreds of coal units, this new rule impacts only a few dozen units.

12. Compared to prior clean air rules, demand for labor to comply with this rule will be very modest. As will be discussed in more detail later, the cost of this rule, which is indicative of the demand for labor, is very small compared to the cost of prior clean air rules. In any event, in the past, skilled labor has responded swiftly to increases in demand and therefore likely will again in this case. And, as will be discussed further later in this declaration, because the demand for construction labor will not be significant prior to late 2026, there is no need for owners and operators to take major action during the litigation period.

13. Boilermakers are skilled laborers who play a key role in the installation of equipment on EGU boilers, and they will have an important role in the installation of equipment for this rule. History with prior rules provides clear evidence of the increased supply of labor when installations of equipment for clean air rules were being implemented. As shown in Figure 1, in the mid-late 1990s boilermaker employment dwindled in response to low construction activities. But, starting in the late 1990s, boilermaker employment grew due to increased demand. Boilermakers were essential for the installation of the selective catalytic reduction (SCR) systems that peaked in the utility industry in 2000 and 2003 and for scrubbers that peaked in installation in 2009. This was in response to the NOx SIP Call, the Clean Air Interstate Rule (CAIR), and the Cross-State Air Pollution Rule (CSAPR) which were being implemented during this period starting in the early 2000s

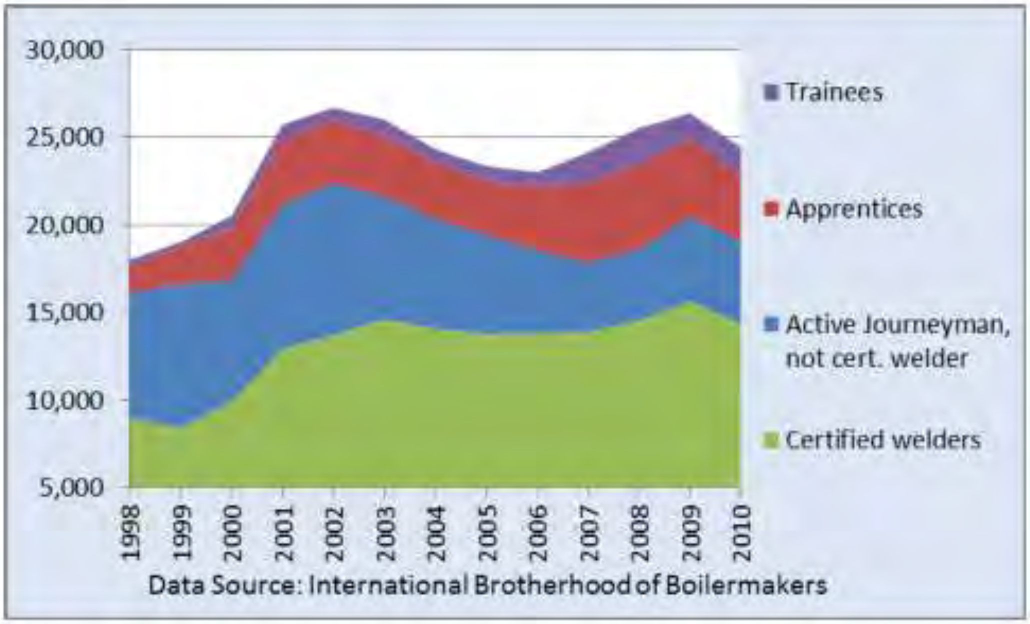
through to about 2010. As Figure 1 shows, construction boilermaker man-hours were closely related to installation of this equipment, and Figure 2 shows that boilermaker trade membership grew quickly between 1998 and 2002 as demand for boilermakers increased to meet the needs for coal EGU retrofits of SCR as well as rapid increases in the installation of gas-fired EGUs.[10] This response in labor supply to demand demonstrates that the supply of labor responded well to the increase in demand over that period of time, and that arguments that the resources would not be available based upon boilermaker membership in the 1990s proved to be wrong.

Figure 1. Boilermaker man-hours and new scrubbers and SCRs in service on coal EGUs – 1990-2011 [11]



[10] Installations of new gas-fired plants is not shown here, but did peak in 2001.
[11] Staudt, J., "Engineering and Economic Factors Affecting the Installation of Control Technologies– An Update", for US EPA Clean Air Markets Division, (Dec. 15, 2011) page 12, https://www.andovertechnology.com/wp-content/uploads/2020/07/9_2002_Update_12152011.pdf.

Figure 2. Construction boilermaker membership – 1998 - 2010[12]



14. EGU owners may also be complying with the stayed Good Neighbor Rule.[13] EPA estimated a substantial number of SCR and selective non-catalytic reduction (SNCR) optimizations for existing controls or the installation of state-of-the-art combustion controls to comply with the Good Neighbor Rule. The estimated cost of the rule for the EGU sector totaled $370 million to $460 million (2016$) annually, meaning the annualized cost of both the Good Neighbor Rule and the updated MATS rule totals well under $1 billion.[14] As will be demonstrated later, this is small relative to the

[12] Staudt, J., "Engineering and Economic Factors Affecting the Installation of Control Technologies– An Update", for US EPA Clean Air Markets Division, at 13 (Dec. 15, 2011).
[13] 88 Fed. Reg. 36654 (June 5, 2023).
[14] Because the Good Neighbor rule has been stayed, compliance costs associated with that rule are unlikely to be incurred during this litigation. As discussed later in this declaration, EPA estimated an annualized cost of the updated MATS rule of $110 million. For the Good Neighbor Rule, see: *Regulatory Impact Analysis for the Final Federal Good Neighbor Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standards,* EPA-452/R-23-001, March 2023, page 32.

annualized cost of past rules, suggesting a low impact on labor. EPA estimated 8 GW of SCR installations by the 2030 model run year (compared to over 25 GW of new SCR online in only 2003 alone), and 2,800 job-years for the 2030 model year inclusive of all construction trades for new pollution controls.[15] Comparing that to historical boilermaker employment data and assuming that as much as half of that value is boilermakers, this is small compared to past increases in boilermaker demand. EPA also forecast additional labor for new capacity. New capacity entails a much wider array of labor than air quality projects on conventional steam generation, and therefore a significantly lower portion of that labor would be for boilermakers. Furthermore, EPA's estimate includes a substantial amount of renewable generation as well as gas fired generation, both of which entail a smaller proportion of labor as boilermakers than for clean air retrofits on coal-fired steam EGUs (clearly, no boilermakers are required for renewable development). The total EPA estimate of construction-related jobs for the power sector for the Good Neighbor Rule, inclusive of all trades, was 15,400 job years in 2025 and 20,500 job-years in 2030.

15. I do not expect that the updated MATS rule will demand anything approaching the level of resources—labor or material—that these prior rules (NOx SIP Call, CAIR, or CSAPR) required. For this reason, and because of the industry's history of meeting the demands for air pollution control equipment, I am confident that the market will respond to and meet the demand for skilled labor and resources that may result from this rule and other power sector rules being implemented concurrently.

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[15] *Id.* at 272.

16. The prior paragraphs explain why I believe that the vendors, labor, and other resources necessary to meet the needs of industry to comply with the MATS revision will be available. The installation data presented in the prior paragraphs are irrefutable historical data. However, when the rules that motivated those air pollution control equipment installations were being developed, and even after they were finalized, the EGU industry argued that the resources were not available to allow industry to comply with the rules in the timeframe permitted or the rules would adversely impact reliability.[16] However, the market for equipment and labor responded to install the equipment, and the EGU industry complied with the rules without the reliability impacts they feared.[17] As a result, I am confident that industry will be able to meet the needs of this rule and reliability will not be impacted.

D. In the two-year period following promulgation of the rule only a small portion of the total cost will be incurred.

17. Air pollution control equipment installation occurs over a period of time that depends upon the specific equipment. Owners of EGUs will typically plan projects to be completed within a few months prior to the compliance date. For example, if the date when emissions rates of the rule must be achieved is July of 2027 (absent a one-year extension), equipment would likely be up and operating in the first or second quarter of 2027. Therefore, most of the

[16] *See* Brattle Group, *Supply Chain and Outage Analysis of MISO Coal Retrofits for MATS*, May 2012; Staudt, J., "Comments on the May 2012 Brattle Group Report", May 16, 2012, available at: https://www.andovertechnology.com/articles-archive.
[17] *See* Staudt, J., "Labor Availability for the Installation of Air Pollution Control Systems at Coal-Fired Power Plants", October 18, 2011, https://www.andovertechnology.com/articles-archive; Staudt, J., "White Paper - Availability of Resources for Clean Air Projects", October 10, 2010, available at: https://www.andovertechnology.com/articles-archive.

procurement and construction activities would be in the last two quarters of 2026 and perhaps into the first quarter of 2027, and these are the activities that entail the greatest demand for labor and materials. As a result, in the two-year period after the effective date of the rule – from July of 2024 to July of 2026 – most activities will be associated with engineering and planning, which are a very small portion of the total project cost.

E. Given an effective date of July 8, 2024, the majority of the Rule's costs will not be incurred until around late-2026.

18. I have personally been involved in the deployment of air pollution control systems at industrial sites. I worked for several years as a technology supplier. Later, in my consulting practice, I advised industrial clients who deployed air pollution control technologies as well as regulators. As such, I am very familiar with how these projects are executed and how costs are realized over the course of a project.

19. Air pollution control projects are conducted over a period of time where the greatest costs are realized in the latter portion of the project. Before any equipment can be ordered, it is necessary to perform sufficient engineering to ensure that equipment that will be ordered is specified correctly. For this reason, in the first months to a year after a project starts, most of the costs will be associated with engineering and permitting, which are generally a small portion of the total project cost. The largest cost items are equipment and installation which are in the final months of the project.

20. As noted elsewhere in this declaration, assuming a compliance date three years from the effective date of the rule, most of the expenditures for this rule will occur beginning in the third and fourth quarters of 2026. With a one-year delay, which may be permissible by permitting agencies in some cases, most expenses could be delayed into 2027. This is because most of

the costs for an air pollution control project are associated with procurement and installation of equipment, which are in the latter stages of a project. Prior to that point, most realized costs entail engineering and development of specifications, which are typically a small portion of the expenses associated with deploying this equipment.

F. The costs to comply are well below those of prior regulations.

21. In the RIA of the final rule, EPA forecast an annual cost of $110 million.[18] This is roughly consistent with ATP's 2023 report estimate of under $156 million[19] (both in 2019 dollars). EPA originally estimated that the 2012 MATS rule would cost $9.4 billion annually (2007$). In my 2015 declaration before the United States Court of Appeals for the District of Columbia Circuit[20] I determined in an *ex post* analysis that EPA overestimated the cost by $7.2 billion annually (2007$), resulting in an actual cost of about $2.2 billion annually. This is 20 times EPA's estimate for the new, updated MATS rule, not accounting for inflation, which would increase the difference.

22. Looking at other rules demonstrates that they had even higher costs compared to the updated MATS rule. According to the National Electric Energy Data System (NEEDS), from 1998 to 2004, 81 GW of coal or oil steam EGUs (virtually all of them coal) were retrofitted with SCR. These

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[18] Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards, EPA-452/R-11-011, December 2011, pages 3-14.

[19] $151 million is ATP's estimate for fPM. Annual costs for lignite units controlling Hg to 1.2 lb/TBtu were under $5 million.

[20] Staudt, J., Declaration Supporting Industry Respondent Intervenors to Govern Future Proceedings in *White Stallion Energy Ctr, LLC. v. EPA*, No. 12-1100 (D.C. Cir., Sept. 24, 2015), available at: www.andovertechnology.com/articles-archive.

were largely in response to the 1998 NOx SIP Call. Assuming a capital cost of roughly $250/kW, this results in an approximate one-time capital cost of $20 billion. Using a capital recovery factor of about 11%, the capital component of that cost alone is $2.2 billion annually. This also does not factor in 20 years of inflation which would raise that cost if represented in 2019$. Operating costs, such as reagent (ammonia), catalyst, and other costs will increase that cost even further. This also does not include the costs of other NOx control technologies used to comply with the NOx SIP Call, like SNCR and low NOx combustion technology.

23. According to NEEDS, during the years from 2007 to 2017, 103 GW of coal steam capacity was retrofitted with wet or dry scrubbers. This would largely be in response to the CAIR, CSAPR, and the Regional Haze Rule (RHR). Assuming an average capital cost of about $500/kW, this totals $52 billion in capital, or an annualized capital cost of about $5.7 billion using a capital recovery factor of 11%. Scrubbers also require the annual purchase of reagent (lime, limestone, etc.), significant energy use, substantial maintenance, and other costs. This also does not address the cost of other approaches for control with these rules, such as dry sorbent injection (DSI), SNCR and SCR for NOx control, and any costs associated with switching fuels. Simply put, the cost to comply with the updated MATS rule is far less than that of prior clean air programs that impacted many more units and entailed installation of more capital-intensive technologies than envisioned here.

G. EPA's *ex ante* cost estimates typically exceed actual compliance costs.

24. In my 2015 Declaration before the United States Court of Appeals for the District of Columbia Circuit,[21] I demonstrated that US EPA's *ex ante* estimate of the cost of complying with the 2012 MATS rule was much more than the actual compliance costs. This is rather typical for EPA's *ex ante* estimates.

   a. EPA's *ex ante* estimates are based upon technical options that are understood at the time of the rule. They do not account for technological innovation that results from the need to comply with the rule. By setting emissions limits in the form of emission rates or capture efficiencies, rather than mandating technology, EPA's rules motivate innovation to find less costly or more effective means of complying with the emission limit. In fact, the statutory language of Clean Air Act Section 112(d)(6) recognizes that methods for controlling emissions improve over time.

      i. *"[t]he Administrator shall review, and revise as necessary (taking into account developments in practices, processes, and control technologies), emission standards promulgated under this section no less often than every 8 years."*[22]

   The 2021[23] and 2022[24] ATP reports identified numerous technological developments that occurred after the 2012 MATS rule, including: advanced activated carbons, advanced reagent

[21] *Id.*
[22] 42 U.S.C. § 7412(d)(6).
[23] Staudt, J., *Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants, for* Center for Applied Environmental Law and Policy (CAELP), August 19, 2021.
[24] Staudt, J., *Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants*, for Center for Applied Environmental Law and Policy (CAELP), April 5, 2022.

injection systems, new means to control Hg in scrubbers, improved means to capture fPM, and other advances. These techniques helped to reduce the cost of complying with the rule versus EPA's *ex ant*e estimate of the cost of the 2012 MATS Rule.

b. Another example of a technical innovation that facilitated a lower cost approach is flue gas conditioning (FGC), which facilitated the widespread use of fuel switching to lower sulfur coals in order to comply with CAA Title IV Acid Rain provisions as well as later rules issued under CAA Section 110 (CAIR, CSAPR, etc.). Rather than continuing with the historical, higher sulfur coal, which was often proximal to the power plant, and using scrubbers to reduce SO_2 emissions, utilities changed fuels to lower sulfur western fuels. While changing fuels was understood as an option, there were some technical challenges due to the impact of fuel sulfur on the performance of the most common fPM control device – the ESP. Major changes to the ESP would be a significant cost impact that would make a change to lower sulfur fuels less economical. However, as noted in a 2023 ATP report,[25] 1990 and 1997 Air Markets Program Data demonstrates that, of the Phase I Title IV units, only 10.5% installed FGD, about 70.7% changed to lower sulfur fuels, and 18.8% continued with similar fuel sulfur levels as in 1990. Changing fuels was made possible through use of FGC, a technology that was not patented until 1993, three years after the

[25] J. Staudt, *History of Flexible Compliance with Science-Based and Technology-Based Stationary Source Air Pollution Regulations,* at 23-25, December 18, 2023, available at: www.andovertechnology.com/articles-archive.

passage of the 1990 Clean Air Act Amendments. Technical innovation therefore played a major role in the use of this lower cost approach to compliance. Use of lower sulfur fuel would also play a substantial role in compliance with other rules, such as CAIR, CSAPR and RHR.

c. Another effect is the willingness of industry to use technologies that were available at the time of the rule, but were not widely used, causing EPA and industry to consider these technologies too uncertain to include in an *ex ante* estimate of compliance costs. However, once there is a need to comply with a regulation, companies will be more open to trying the technology. An example is SNCR. As described in ATP's 2023 report,[26] although EPA stated that state NOx RACT emission limits were to be "consistent with the most effective level of combustion modification reasonably available for its individual affected sources," in several cases, coal-fired EGUs selected SNCR over combustion controls. SNCR had been available prior to this point, but there was very little experience on coal-fired EGUs at this point. Once faced with the need to reduce NOx emissions, utilities became more open to using SNCR technology.

H. EPA's regulation allows operators to run controls with a reasonable margin of safety to meet the fPM standard during normal operation.

25. Facility owners may choose to operate their equipment so that it can provide an emission rate that is sufficiently below the emission limit that the risk of

[26] *Id*. at 12-15.

exceeding the limit is acceptably low. This is often referred to as "compliance margin". As such, it impacts the number of facilities that are likely to opt for equipment upgrades and the cost. EPA anticipates that 33 units will require fPM emission control upgrades, and 22 lignite-fired units will make changes for Hg control.[27] This is consistent with the analysis performed by ATP in 2023.[28] Total annual costs estimated by EPA are also in a similar range as those determined by ATP. In its analysis, ATP utilized a compliance margin of 20% below the limit.

26. EPA looked at what adding a compliance margin of 20% would mean to its analysis.[29] Although EPA estimated that it would increase the number of facilities opting for significant fPM upgrades from 33 to 53 and increased annualized compliance costs to $147.7 million (nearly identical to what I determined for ATP in 2023), it would not increase the number of expected new baghouse installations, which is the highest cost option considered in the analysis.

27. EPA's treatment of fPM rates adds a significant degree of conservatism to their analysis that effectively results in compliance margin. In their analysis, EPA selected the lowest value of all quarterly 99th percentiles as the lowest achieved emission rate. This, in effect, is the highest rate for the lowest quarter. As a result, the typical rate is actually lower than what EPA used for the baseline emission rate. As shown in Figure 3, which plots the 99th percentile emission rate for the lowest quarter for affected units from highest

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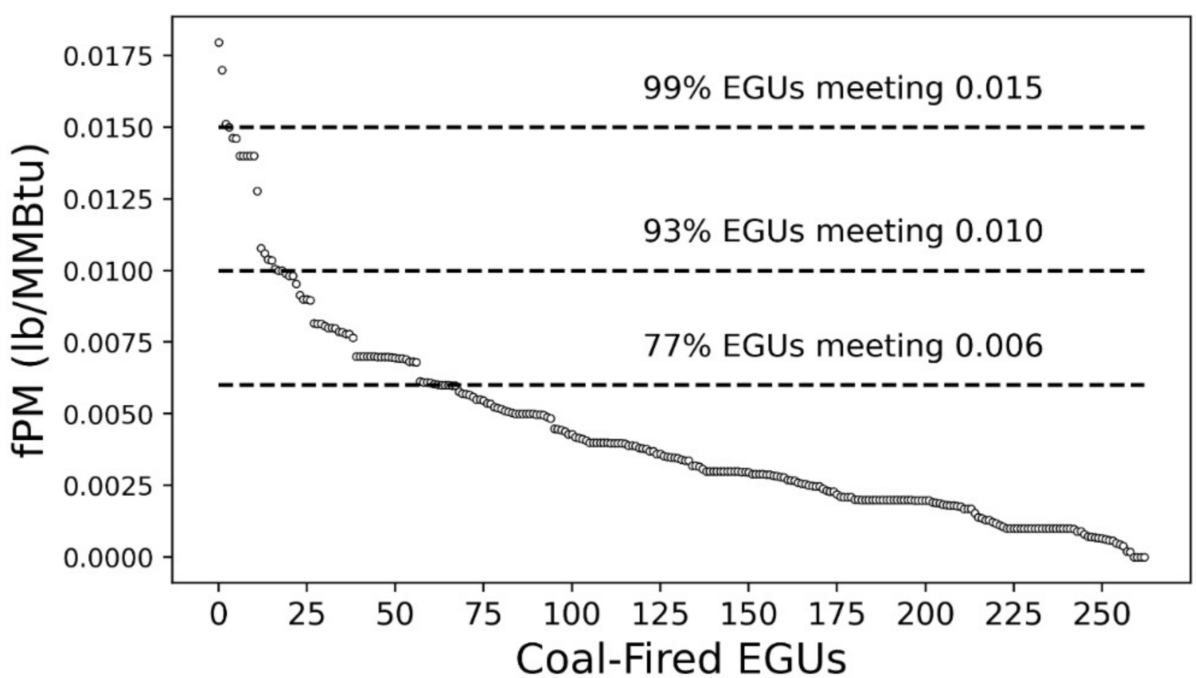
[27] Mercury and Air Toxics Standards (MATS) for Coal-Fired Power Plants Review of the 2020 Residual Risk and Technology Review (RTR), Final Rule, April 25, 2024.
[28] Staudt, J., *Assessment of Potential Revisions to the Mercury and Air Toxics Standards, for Center for Applied Environmental Law and Policy*, June 15, 2023.
[29] 89 Fed. Reg. 38521 (May 7, 2024).

to lowest fPM rate, even the highest fPM emission rates are at or below 0.010 lb/MMBtu for 93% of affected units. As will be demonstrated later in this declaration, the average fPM rate for a particular unit is typically well below the 99th percentile rate. As a result, the impact of using the 99th percentile of the lowest quarter as the baseline fPM rate provides a significant degree of conservatism.

Figure 3. fPM emission rates from coal-fired EGUs ranked, from left to right, from highest fPM emitting to lowest fPM emitting. Data is the 99th percentile of the lowest quarter rate. The dashed lines show the percentage of units that have previously demonstrated emission rates below 0.015, 0.010, and 0.006 lb/MMBtu.[30]



[30] Benish, S, Hutson, N., Eschmann, E., US EPA, 2024 Update to the 2023 Proposed Technology Review for the Coal- and Oil-Fired EGU Source Category (2024 Technical Memo), Docket ID. No: EPA-HQ-OAR-2018-0794, January 2024.

28. In estimating the cost of the rule, EPA did incorporate an additional cost of $100,000 per year in additional effort to maintain emissions control equipment,[31] which is equivalent to a technician at half time (20 hours per week) at $65/hour plus an additional 50 percent for materials. This is a reasonable effort for a technician to monitor the ESP performance and make typical repairs (repairing leaks in the casing, repairing failed insulators, etc.). This alone could be sufficient for many units to regularly achieve emissions well below the 99th percentile of the lowest quarter. Because of this, some units that have 99th percentile emission rates in the lowest quarter that are above the emissions rate limit of the updated MATS rule may be able to comply with the rule simply through added vigilance at a lower cost than EPA estimated for an ESP upgrade. This would reduce the actual cost of the rule from what EPA has estimated.

29. America's Power and Electric Generators MATS Coalition claimed that EPA stated that a memo regarding PM CEMS random error claimed compliance margin as high as 50% was appropriate.[32] This is incorrect. The memo in question[33] evaluated the random error contribution of the total tolerance percentage. The term "compliance margin" does not appear anywhere in the document.

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[31] *Id.* at 15.
[32] *America's Power & Electric Generators MATS Coalition v. EPA*, No. 24-1201, Petitioners' Motion for Stay Pending Judicial Review at 19 (D.C. Cir., July 8, 2024).
[33] U.S. Environmental Protection Agency, PM CEMS Random Error Contribution by Emission Limit, March 22, 2023, Docket ID No. EPA-HQ-OAR-2018-0794.

I. The 30-day averaging period is sufficient to address any spikes or variability in emissions.

30. ESPs occasionally have insulators that fail, electrodes that fail, or duct or casing leaks. All of these periodic issues impact ESP performance, and they can be readily addressed. Similarly, baghouses can have filter bags that develop leaks that can be readily addressed. Spikes and variability that increase fPM rate, therefore, may occur, and these may need to be offset by lower fPM rates to compensate for the spike and maintain compliance when averaging over the 30-day period. With a PM CEMS it is possible to quickly identify the issue with the fPM control equipment and then promptly correct it.

J. PM CEMS enable prompt identification of a performance-impacting malfunction that can be corrected

31. PM CEMS provide a continuous data stream of fPM emissions. If an equipment malfunction occurs, PM CEMS will permit the facility owner to immediately see the impact of the problem and promptly take corrective action. Therefore, the PM CEMS can help avoid exceedances and enable plants to achieve lower emissions rates overall, even with the same pollution control equipment. This has been demonstrated with actual data that compares 30-day rolling average to daily average data and data suggestive of corrective action.[34]

[34] See Appendix in Staudt, J., *Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants, for* Center for Applied Environmental Law and Policy (CAELP), August 19, 2021.

32. Comments on the proposed rule,[35] a portion of which were also incorporated into a Motion to Stay that is discussed later, included some critiques about variability in emissions rates. But, these comments also demonstrate how corrective measures are taken. A graph in these comments[36] that presented the quarterly mean and 99th percentile fPM emission rates at Coronado Generating Station shows some variability from quarter to quarter. Coronado's fPM emissions rate in this data shows levels greater than the median in Figure 3, which is well below 0.0050 lb/MMBtu. In the case of Coronado, there were peaks in 18Q4 and 21Q2. However, this graph (shown in Figure 4 with additional notation) shows two sawtooth patterns – some that span over two years. I reviewed fuel purchase and use data in Form 923[37] and operating data (generation) for these periods, and I did not see anything in the fuel use history or operating history that would explain the variations shown. Therefore, this was likely the result of addressing fPM equipment effects, such as failed insulators or electrodes. Coronado is equipped with ESPs and wet FGD.

a. The figure and my analysis make it clear that:

- The mean fPM rate is typically well below the 99th percentile rate, as noted earlier in my declaration.
- These patterns of variability are not seasonal, as they span more than a year.

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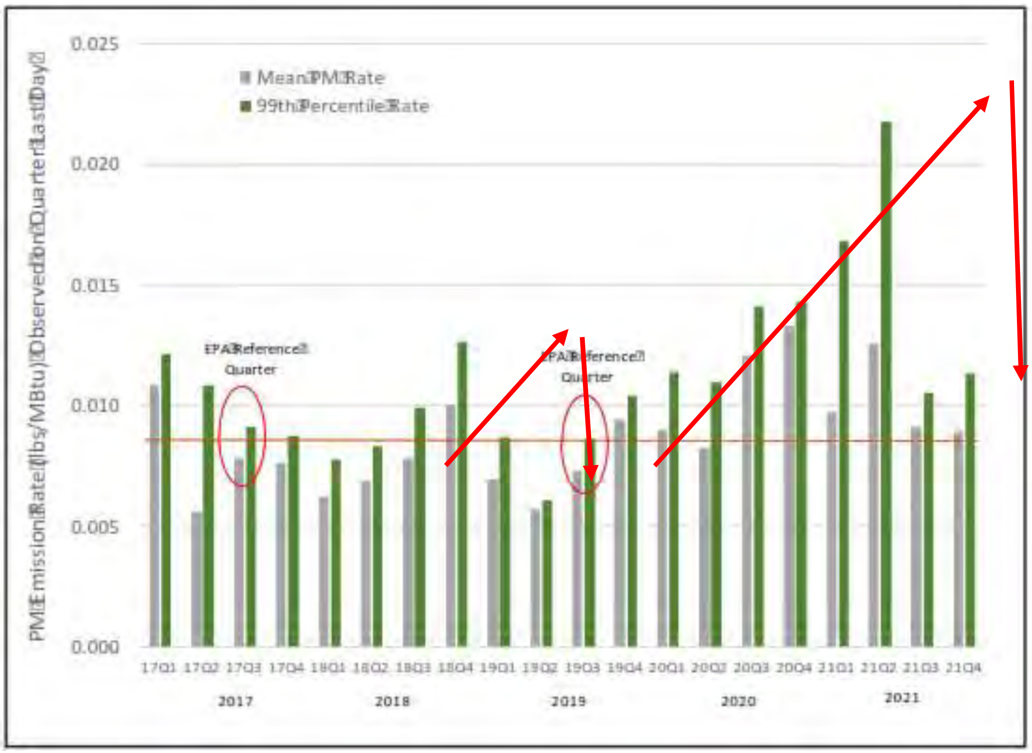
[35] America's Power Comments on EPA's Proposal to Revise the Mercury and Air Toxics Standards: Technical Comments on National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-fired Electric Utility Steam Generating Units Review of Residual Risk and Technology, by Cichanowicz, et. al. June 19, 2023.
[36] *Id.* at 10 (pdf page 20).
[37] Energy Information Administration (EIA) Form 923 includes reported monthly fuel use, fuel characteristics, generation, fuel purchase and other data.

- There is nothing in the operating history or fuel used that explains this.
- For Coronado, these patterns suggest that some intervention may have been made early in quarters 19Q1 and 21Q3 that caused a significant drop in PM emission rates.
- Each of these apparent interventions brought the mean fPM rate below 0.010 lb/MMBtu.[38]

Figure 4. Coronado Generating Station, 20 operating quarters[39]



b. This data therefore suggests that periodic intervention, which can be facilitated by PM CEMS (which will enable even quicker intervention), can improve fPM emission rates. The other

[38] Notably, from 17Q2 to 20Q2 the average quarterly fPM emission rate remained at or below 0.010 lb/MMBtu.

[39] *Id*. at 10 (with additional notation).

examples in Appendix B of the comments[40] also show trends suggesting that additional vigilance in monitoring PM control device performance and occasional intervention will result in more consistent and lower fPM emission rates.

33. EPA examined a large number of facilities in a technical memorandum and looked at variability in particular.[41] EPA also looked at additional quarters of data, examining 30-day average emissions for some units. EPA determined that, while the lowest achieved rate was not representative of the average emission rate over longer periods, "the lowest achieved fPM rate remains effective for identifying EGUs that have historically achieved lower fPM rates, despite not being required to do so and without additional capital investments."[42] Therefore, some of these units that had average emission rates above the limit could potentially meet the limit with existing equipment on a consistent basis with additional effort to maintain and operate their fPM equipment for more consistently low emissions, particularly with PM CEMS alerting operators to problems with PM controls or spikes in PM emissions that could be promptly corrected.

34. From a CEMS performance perspective, there is substantial operating experience with PM CEMS demonstrating that compliance with a 30-day rolling average fPM rate of 0.010 lb/MMBtu is regularly measured. Figure

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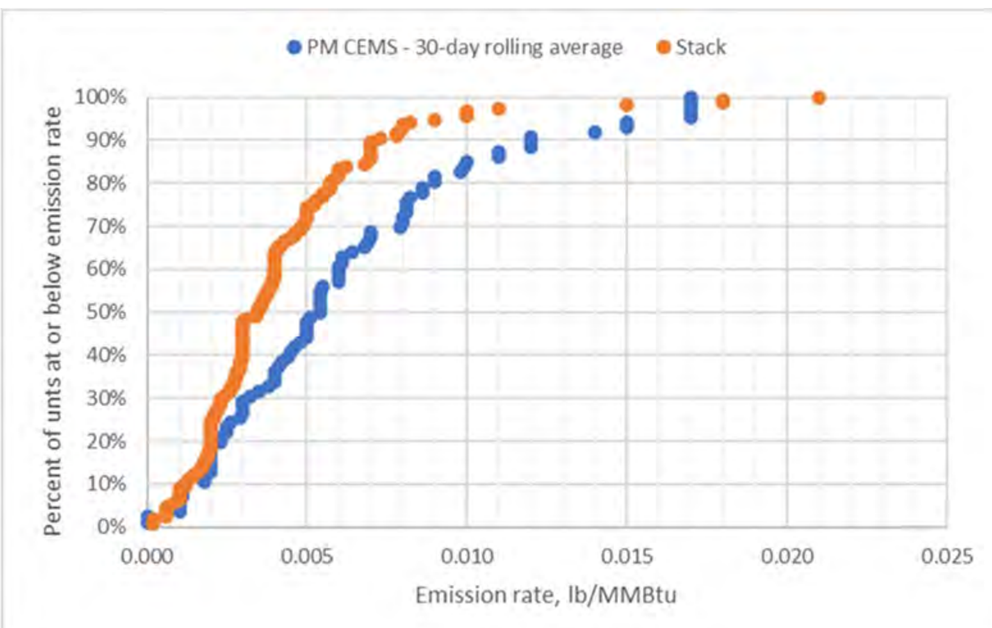
[40] America's Power Comments on EPA's Proposal to Revise the Mercury and Air Toxics Standards: Technical Comments on National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-fired Electric Utility Steam Generating Units Review of Residual Risk and Technology.

[41] Benish, S, Hutson, N., Eschmann, E., US EPA, 2024 Update to the 2023 Proposed Technology Review for the Coal- and Oil-Fired EGU Source Category (2024 Technical Memo), Docket ID. No: EPA-HQ-OAR-2018-0794, January 2024.

[42] *Id.* at 8.

5 is from ATP's 2023 report[43] that assessed the proposed MATS rule. This shows the 99th percentile of fPM emissions rates for the lowest quarter. As shown, about 85% of the units included in that data equipped with PM CEMS reported 30-day averages at or below 0.010 lb/MMBtu. In fact, nearly 50% of all PM CEMS equipped units reported 30-day averages at or below half of that rate. Since these are the highest emissions of the lowest quarter, the actual averages are less than this. As a result, the data indicates that the majority of units equipped with PM CEMS are already well under the new emission limit, and apparently are not having difficulty meeting the emission limit or measuring emissions at that level.

Figure 5. Percent of units with a measurement method (PM CEMS or stack sampling) with baseline (99th percentile of lowest quarter) fPM emissions at or below a particular emission rate[44]



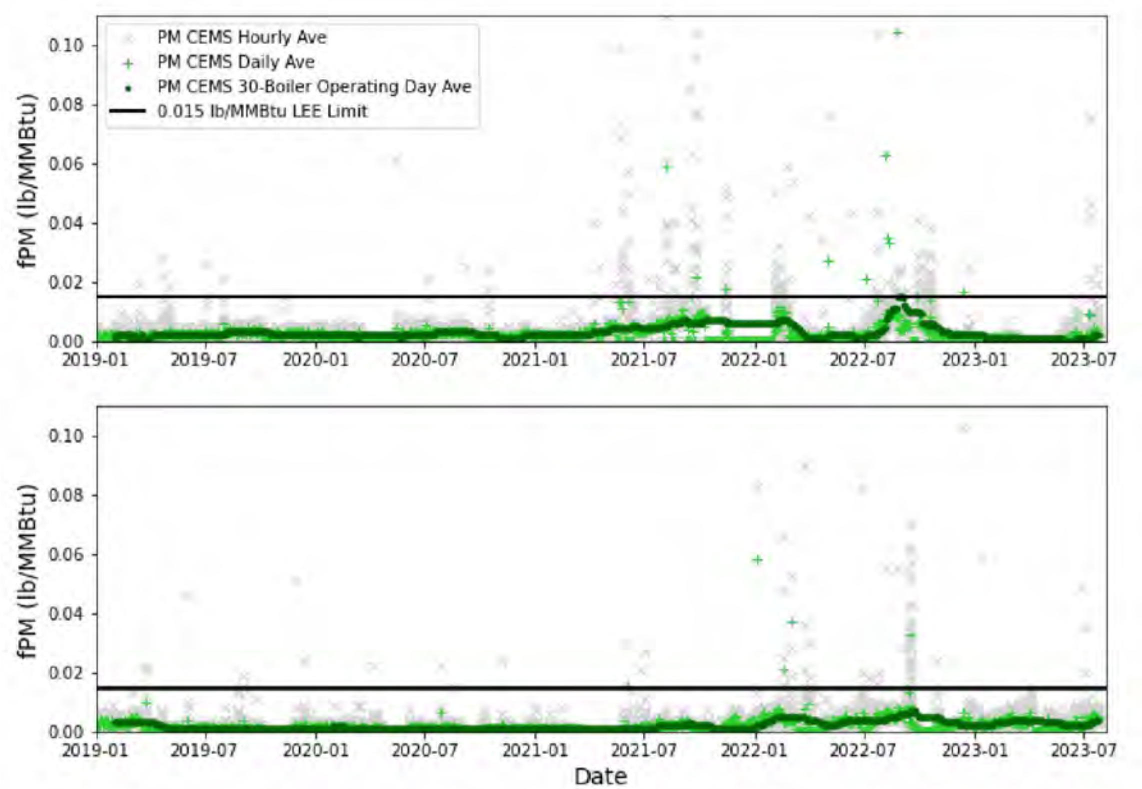
[43] Staudt, J., *Assessment of Potential Revisions to the Mercury and Air Toxics Standards, for Center for Applied Environmental Law and Policy*, June 15, 2023, available at: www.andovertechnology.com/articles-archive.

[44] Developed from Appendix C data from 2023 Technology Review for the Coal- and Oil-Fired EGU Source Category, proposed rule.

35. EPA provided an analysis demonstrating the transparency benefits of using PM CEMS.[45] This analysis includes data that also illustrates the impact of averaging over a 30-day limit. EPA examined a facility that qualified as a low emitting EGU (LEE). It had fPM CEMS installed due to a consent decree, even though it could demonstrate compliance with MATS through intermittent stack testing every three years, and could comply with an emission limit of 0.015 lb/MMBtu. The data presented demonstrates the effects of averaging. Figure 6 shows the fPM CEMS emissions data for two units between 2019 and mid-2023. For Unit 1A the hourly value ranged from near zero to as high as 1.33 lb/MMBtu, with average and median values of 0.0028 and 0.0020 lb/MMBtu, respectively. The figure shows the daily average (light green) and the 30-day average (dark green). It is clear that the 30-day average is typically far below the LEE limit of 0.0150 lb/MMBtu and rarely gets close to the limit, although several hourly emission rates are well above the limit and some daily rates are well above the limit. Similarly, for Unit 1B, the same effect is shown, while generally that unit has even lower emission rates that are all below the MATS update emission rate of 0.010 lb/MMBtu on a 30-day average. So, it is clear from this data that averaging over a 30-day period has a profound impact in averaging out even very high shorter-term emissions rates.

[45] Benish, S, Hutson, N., Eschmann, E., US EPA, 2024 Update to the 2023 Proposed Technology Review for the Coal- and Oil-Fired EGU Source Category (2024 Technical Memo), Docket ID. No: EPA-HQ-OAR-2018-0794, January 2024, page 42.

***Figure 6. PM CEMS data for Units 1A (top) and 1B (bottom) between 2019 and mid 2023.*[46]**



K. EPA's estimated cost of a PM CEMS is reasonable

36. In their Motion to Stay the Rule, the Midwest Ozone Group claimed that EPA underestimated the cost of PM CEMS.[47] EPA estimated an annual cost of $72,000 for the cost of operating a PM CEMS. This includes annualized capital and other annual costs. One source[48] stated that the initial cost was $120,000 per year with annual costs $40,000 per year. Another source[49]

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[46] *Id.* at 44.
[47] *Midwest Ozone Group v. EPA*, No. 24-1119, Motion for Stay, at 6 (D.C. Cir., July 8, 2024).
[48] PS-11 (PM CEMS), Multi-metals CEMS, Multi-metals Fence Line Monitoring, & CEMS Cost Model; https://www3.epa.gov/ttn/emc/meetnw/2007/cemsupd.pdf
[49]Stuart, Derek, "PM-CEMS and PM-CPMS for Dry Stacks", https://www.mcilvainecompany.com/Decision_Tree/2015%20WEBINARS/April%202015/Derek%20Stuart,%20Ametek%20-%204-16-15.jpg.pdf.

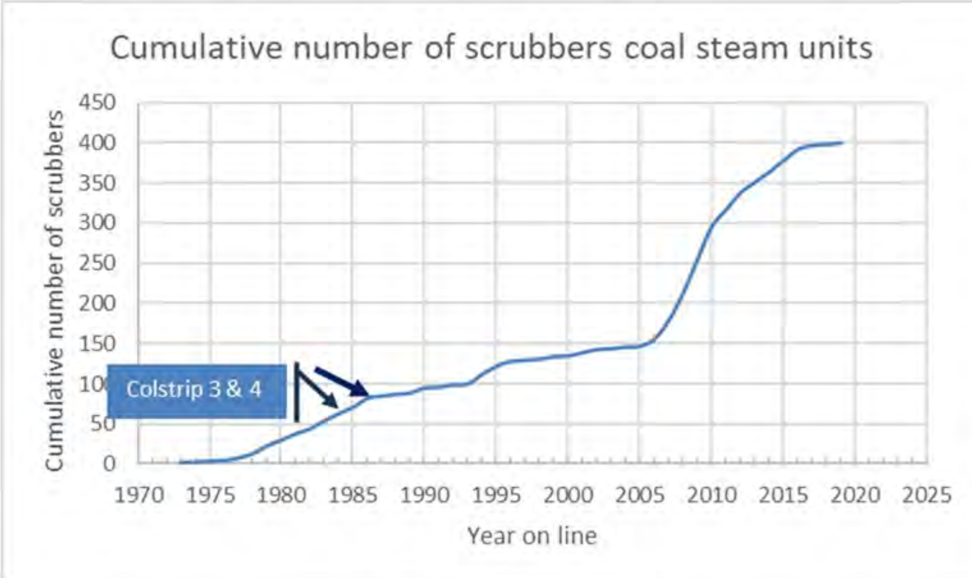
indicated the monitor would cost about $40,000, initial testing $30,000, plus installation – which would be close to the other estimate of $120,000 initial cost. As a result, an annualized cost of $72,000 for annual cost plus annualized capital would be very reasonable.

L. Colstrip Power Plant has no dedicated PM control device but can be retrofit to comply with the MATS Update Rule.

37. Talen Montana, LLC and Northwestern Corporation jointly submitted a motion to stay the Update Rule. Colstrip Units 3 & 4 are the sole coal-fired EGUs in the United States with no dedicated PM control device such as an ESP or baghouse. To control both fPM and SO_2, these units instead use venturi scrubbers[50] that were put in place in the mid-1980s (1984 and 1986). Therefore, they are currently about 40 years old, and are among the oldest scrubbers on coal-fired EGUs, as demonstrated in Figure 7. As shown in Figure 7, of the scrubbers on the nearly 400 coal-fired EGUs, over 60% were built in the last 20 years. The Colstrip scrubbers are among the oldest 20% of all scrubbers, and virtually no scrubbers are more than 10 years older than those at Colstrip. Notably, each of the other nearly 400 scrubbed EGUs is installed with a dedicated fPM control device. So, for about 40 years, while other companies installed and operated dedicated fPM control devices, Colstrip has operated with a venturi scrubber.

[50] Venturi scrubbers are a form of wet scrubber that combines both fPM and SO_2 control.

Figure 7. *Cumulative number of active coal steam units with scrubbers*[51]



38. Moreover, venturi scrubbers, such as those at Colstrip, have generally been abandoned as obsolete technology. For example, the Dave Johnston plant in Wyoming replaced its 1972 venturi scrubber with a pair of dry scrubbers and baghouses in 2010 and 2012, 40 years after that venturi scrubber was installed.[52]

39. In their motion to stay, Talen and NorthWestern mention EPA's citation of a report that I prepared (page 9-10) that described the fact that fabric filter material has improved since 2012. This is a fundamental improvement to the technology, as the filter media is what actually does the filtering. Improved fabrics enable significant improvements in performance and are regarded as technology developments. As noted in my ATP 2021 report

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[51] Developed from active units in NEEDS v6.
[52] See NEEDS v.6 and 2012 EIA Form 860.

and in a memo to EPA by Sargent & Lundy,[53] since the 2012 MATS rule, there have been improvements in filter bag materials that make fabrics more durable, easy to clean, and this will translate into lower fPM emissions because fabric failure or other means of leakage are the most common mechanisms for increased emissions. So, improved fabrics certainly constitute advancements, innovation and evolution of the fabric filter technology, and this is the technology that was identified by Talen Montana[54] for use at Colstrip.

1. fPM equipment can be retrofit at Colstrip Power Plant

40. Talen Montana's comments on the proposed Update Rule[55] include a memo from Burns and McDonnell (B&M) that confirms that a fabric filter, dry ESP, or wet ESP could be retrofit after the venturi scrubber. It also examines installation of a dry ESP or fabric filter prior to the venturi scrubber.

41. Attachment A of Exhibit 1 of Talen Montana and NorthWestern's joint motion to stay is a report from B&M that provides a cost estimate for a fabric filter of about $356 million. The fabric filter would be installed after reheat and prior to the chimney.

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[53] *See* Staudt, J., *Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants, for* Center for Applied Environmental Law and Policy at 26-28 (CAELP), August 19, 2021; PM Incremental Improvement Memo, Sargent & Lundy (2023); EPA Memo "2023 Technology Review for the Coal- and Oil-Fired EGU Source Category" (Docket ID. No: EPA-HQ-OAR-2018-0794).

[54] See Attachment A to Exhibit 1 of *Talen Montana, LLC & NorthWestern Corp. v. EPA*, No. 24-1190 and 24-1217, Joint Motion for Stay (D.C. Cir., June 27, 2024).

[55] Comments of Talen Montana, LLC on the Proposal on National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, Docket ID: EPA-HQ-OAR-2018-0794.

42. It is apparent that fPM control technology can be retrofit onto the Colstrip plant to bring it into compliance with the MATS Update Rule. The difference between EPA's estimate and that of B&M is only about 16%.[56] Given the typical accuracy range of Class 4 or 5 estimates, this is a small difference. The consistency in the cost estimates between B&M and EPA confirms that installation of retrofit fPM controls at Colstrip is possible at a reasonable cost. Colstrip does not have an announced retirement date.[57] Therefore, a shorter amortization period than a typical 20-year amortization is not justified in an economic analysis.[58]

2. The technology can be installed in time to comply with the rule, and any costs incurred during litigation would be small.

43. Prior discussion in this declaration addresses the timing to install controls. Fabric filters can be installed in two years from engineering through commissioning. Most costs are incurred in the final year or months, with prior costs for engineering representing a small portion of the total project cost. Therefore, with a three-year compliance period, the higher cost procurement and installation efforts would be in the final year. With an additional year, even the engineering could be delayed until after the

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[56] Attachment 1 to: Benish, S, Hutson, N., Eschmann, E., US EPA, 2024 Update to the 2023 Proposed Technology Review for the Coal- and Oil-Fired EGU Source Category (2024 Technical Memo), Docket ID. No: EPA-HQ-OAR-2018-0794, January 2024. EPA's cost was $204/kW and $205/kW, respectively for each of the two 740 MW units, which results in a cost of $303 million.

[57] *Talen Montana, LLC & NorthWestern Corp. v. EPA*, No. 24-1190 and 24-1217, Joint Motion for Stay at 14 (D.C. Cir., June 27, 2024).

[58] *Id.* at 11. Talen Montana and NorthWestern argue that the GHG Rule will compel retirement in 2031. This is incorrect. The GHG Rule offers options for compliance that a company may choose to use, or they may alternatively choose to retire.

expected litigation period and still allow a plant to meet its compliance deadline.

RESPONSE TO NORTH DAKOTA AND WEST VIRGINIA MOTION TO STAY

44. North Dakota and West Virginia submitted a Motion to Stay.[59] The Motion to Stay includes several declarations and exhibits. Among these declarations are those of Sonja Nowakowski, Jason Bohrer, Gavin McCollam, Robert McLennan, and Claire Vigesaa. The motion to stay also included reports prepared by Sargent & Lundy on the Milton R. Young (MRY) plant (Attachments A and E)[60] and Attachment B, hereafter referred to as the Cichanowicz report.[61] Attachment D is a report by Sjostrom. Issues discussed in these declarations include arguments questioning the ability to control lignite units' Hg emissions to 1.2 lb/TBtu and arguments questioning the ability to control fPM emissions to under 0.010 lb/MMBtu and the costs to control fPM emissions.[62]

A. Properties of lignite coal do not preclude control of Hg emissions to 1.2 lb/TBtu

45. Declarants in the Motion to Stay argued that the properties of lignite coal preclude the ability to control to 1.2 lb/TBtu. They argued that lignite coal properties were too variable and otherwise too challenging for controlling to

[59] *North Dakota v. EPA*, No. 24-1119, Amended Motion for Stay (D.C. Cir., June 7, 2024).
[60] *See* Attachments A and E to Exhibit 9, Declaration of Robert McLennan, at 167 and 249 of *North Dakota v. EPA*, No. 24-1119, Amended Motion for Stay (D.C. Cir., June 7, 2024).
[61] Attachment B, J. Cichanowicz et al., Technical Comments on National Standards for Hazardous Air Pollutants: Coal- and Oil-fired Steam Generating Units Review of Residual Risk and Technology (June 19, 2023) to Exhibit 9, Declaration of Robert McLennan, at 184 of *North Dakota v. EPA*, No. 24-1119, Amended Motion for Stay (D.C. Cir., June 7, 2024) (hereinafter "Cichanowicz Report").
[62] Paragraphs 25 through 29 of this declaration address compliance margin for fPM emission control.

1.2 lb/TBtu. They raised questions about variable Hg content, sulfur content and alkalinity. Lignite coal does generally have higher Hg content than other coals, but as will be shown, some bituminous coals have higher Hg content than most lignite coals and that Hg is even more variable for some bituminous coals.

1. Impacts of mercury, sulfur, alkalinity, and configuration

Mercury variability

46. The Cichanowicz report examines Hg variability by examining data from mines for Hg, alkalinity and sulfur data. The report shows mine data. Mine borehole data is less useful than using data regarding the coal that is actually used in the plant, which is available in EIA Form 923 Fuel Receipts and Cost.

47. Where EIA Form 923 data was shown in the Cichanowicz report, it was combined for many different mines and plants. Figure 6-8 of the Cichanowicz report shows Hg and sulfur data for various plants firing lignite coals. However, since this includes data from 60 lignite mines and 40 PRB mines, it is not useful for determining the situation at any given plant. Lignite coal plants are mine-mouth, and therefore only receive coal from the local mine. As demonstrated in the following paragraphs, for any given plant the variation is quite small.

48. MRY mercury data in Attachment A stated that it had an average of 8.41 lb/TBtu and a maximum of 17.42 lb/TBtu.[63] Standard deviation was not provided. On the other hand, a calculation of average and standard deviation

[63] Exhibit 9, Declaration of Robert McLennan, Attachment A, Minnkota Power Coop., Mercury Testing Results for the MATS Residual Risk and Technology Review (May 22, 2023), at 6, tbl. 2-4, in *North Dakota v. EPA*, No. 24-1119, Amended Motion for Stay (D.C. Cir., June 7, 2024).

of the data provided in Table 2-5 of Attachment A resulted in an average of 10.3 lb/TBtu and a standard deviation of 3.28 lb/TBtu.[64] Both MRY units are equipped with a cold-side ESP and a wet scrubber.

49. EIA Form 923 Hg data for lignite-fired plants and the data for one bituminous coal mine (Hoover Job, which is used at the Conemaugh plant in Pennsylvania) for 2020 through 2023 were evaluated. Not all plants submit Hg content data for EIA Form 923. The average and population standard deviation are shown in Figure 8 along with the MRY average and standard deviation of the data in Table 2-5 of Attachment A.

50. The figure demonstrates that for each of the lignite-fired facilities where Hg data was available, the standard deviation is well below the average Hg content, indicating little variation. The MRY plant coal Hg standard deviation, as a percentage of the average, was the highest of the lignite units, at around 32%. It was also a relatively low Hg content for the lignite units, at about 10 lb/TBtu. The next highest standard deviation was Coyote plant at 22%, but, again with an average Hg concentration of under 10 lb/TBtu. For the bituminous mine, Hoover Job mine in Pennsylvania, the standard deviation is well above half of the average, indicating significant variation and *much higher than any of the lignite units*. And the Hoover Job mine has an average Hg content over 40 lb/TBtu. Yet, as a bituminous fired unit, per the 2012 MATS rule, the Conemaugh plant has been required to maintain emissions below 1.2 lb/TBtu. In fact, the Hg reported emissions have been consistently below 1.2 lb/TBtu for both Conemaugh units, as demonstrated

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[64] This was calculated by using the average and stdevp function in Microsoft Excel for the data in the table.

in Figure 9, despite having coal with higher Hg content than many lignite plants.

Figure 8. Average mercury content (lb/TBtu) and population standard deviation[65]

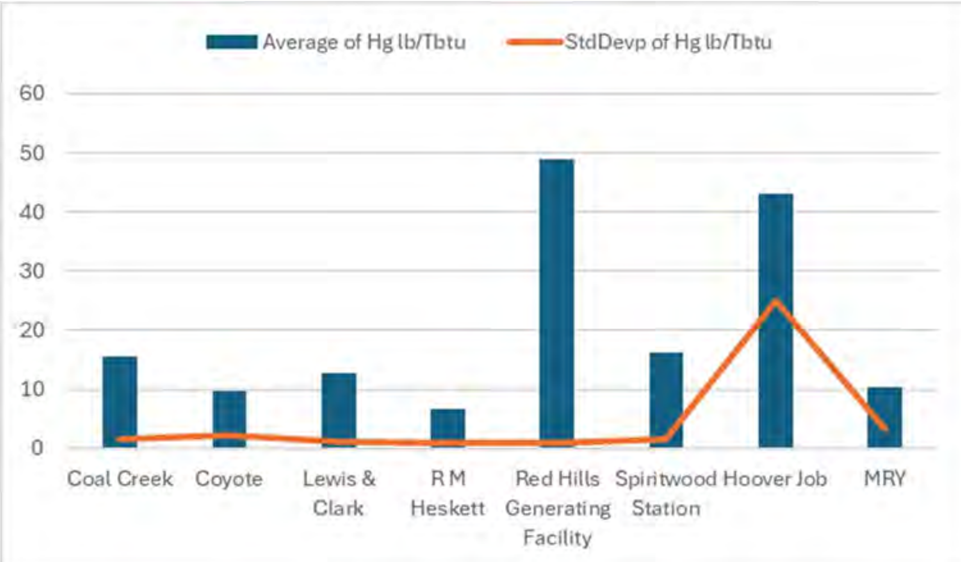
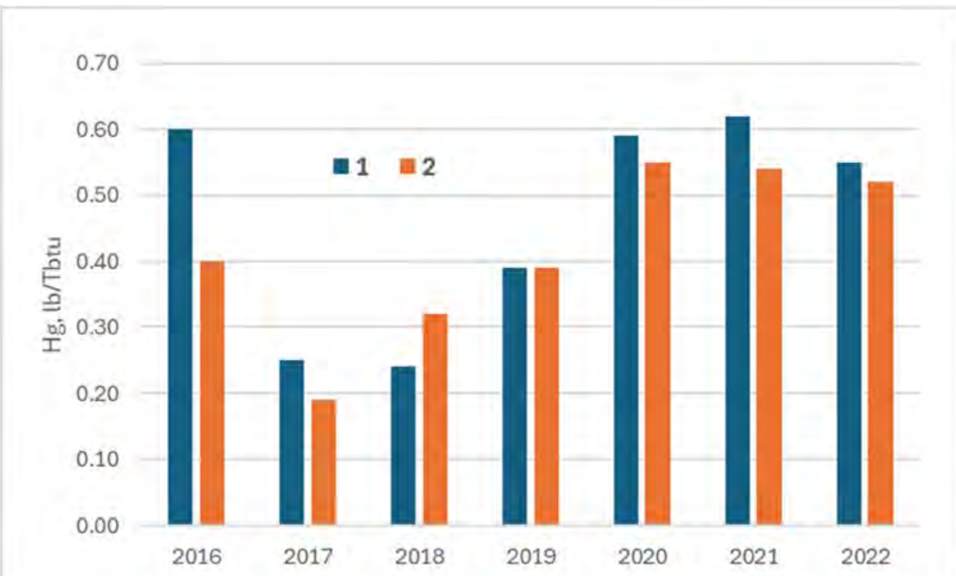


Figure 9. Conemaugh Units 1 & 2 reported Hg emissions (lb/TBtu)[66]



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[65] Calculated from 2020 and 2021 EIA Form 923 Fuel Receipts and Cost. Reported Hg content in ppm is multiplied by 2000 and divided by heat content in MMBtu per ton of coal.
[66] Data from EIA Form 923.

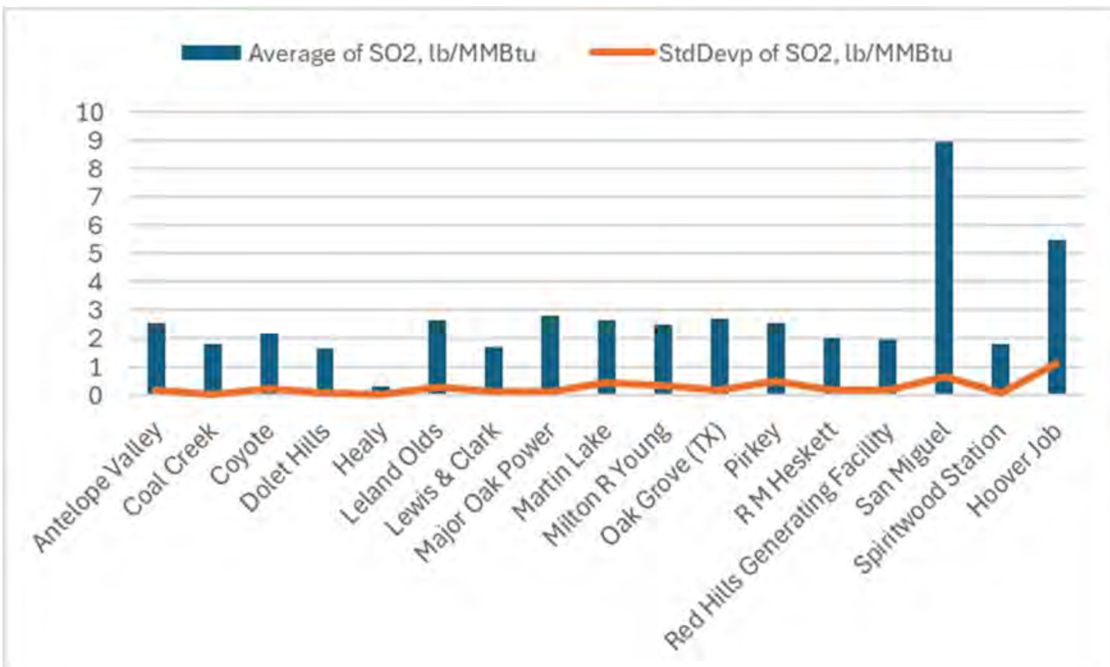
Impact of sulfur and alkalinity

51. The principal concern with sulfur is SO_3, which can adversely impact Hg capture by ACI. The majority of coal sulfur is oxidized to SO_2 and a smaller portion is oxidized to SO_3. SO_3 formation is impacted by the coal sulfur and factors such as whether an SCR is present. SCR will oxidize sulfur and result in higher SO_3 levels. Sulfur data, and therefore inferred SO_2 emissions, is more available than Hg data. As shown in Figure 10, standard deviation of inferred SO_2[67] in the exhaust gas is small for lignite coals. This provides some insight to the SO_3 content of the flue gas. Also, the Hoover Job mine, like many other bituminous coals, results in significantly higher SO_2 content (and, presumably higher SO_3 content) than most of the lignite coals. The SO_2 levels for the Hoover Job mine are typical for high-sulfur bituminous coals, such as Illinois Basin coals or Northern Appalachian coals. Most Central Appalachian coals result in higher SO_2 levels (and therefore higher SO_3 levels) than lignite coals. These figures clearly demonstrate that the Hg and SO_2 content resulting from lignite coals are no more problematic than some bituminous coals that have long been subject to the 1.2 lb/TBtu limit. Moreover, the majority of high-sulfur bituminous coal capacity has SCR systems for NOx control, which means that SO_3 oxidation is generally a greater concern for those bituminous units than for lignite units. Only one lignite plant (Oak Grove in Texas) is equipped with SCR. Therefore, the issue of SO_3 is no more challenging and likely less challenging for lignite units than for eastern bituminous units equipped with SCR.

[67] SO_2 was inferred by multiplying the reported percent sulfur in EIA Form 923 by 40 and dividing by the heat content in MMBtu per ton of coal.

52. Alkalinity is a factor because it can mitigate SO_3. Alkalinity can vary widely for bituminous coals, with some Northern Appalachian coals that have high sulfur also having low calcium content, and generally lower alkalinity than western coals. It is also possible to add alkalinity, if needed. This has been done on bituminous coal boilers in order to address SO_3.[68] And, this does not factor in the availability of sulfur tolerant activated carbons that are discussed more in the next paragraph.

Figure 10. Average inferred SO_2 (lb/MMBtu) and population standard deviation[69]



53. SO_3 is not the issue that it once was because activated carbon is now available that can address high concentrations of SO_3 without relying upon

[68] Power Magazine, "Dry Injection of Trona for SO3 Control", (May 1, 2010).
[69] Calculated from 2020 and 2021 EIA Form 923 Fuel Receipts and Cost.

alkalinity to address SO_3.[70] These carbons were not available at the time the 2012 MATS rule was developed. These carbons were mostly developed to address bituminous coal units in order to avoid addition of alkalinity, especially unscrubbed units that had to capture all of the Hg in the ESP.

54. The Cichanowicz report suggested that sulfur and alkalinity content were highly variable and had a major impact on Hg capture. But, for affected lignite facilities, sulfur and alkalinity should not be a major factor. As shown, SO_2 is not highly variable for any given lignite-fired unit, and SO_2 (and presumably, SO_3) is generally lower for lignite units than bituminous units. Sulfur and alkalinity are most important when ACI is heavily relied upon for Hg capture for units with ESPs and no other equipment (such as a scrubber) is available to capture Hg. As noted below, no affected lignite unit has this ESP-only configuration. In fact, Attachment D to the Motion to Stay is a paper by Sjostrom, et. al. It discusses the general state of Hg capture at the time and compares the ability to control Hg for different coals. On the second page of the paper it states: "ACI at sites firing western fuels, such as PRB coals or lignite (Lig.) coals, results in higher mercury removal than sites firing bituminous (Bit.) coals." So, this clearly suggests that bituminous coals are generally more difficult than lignite coals for controlling Hg emissions when using ACI.

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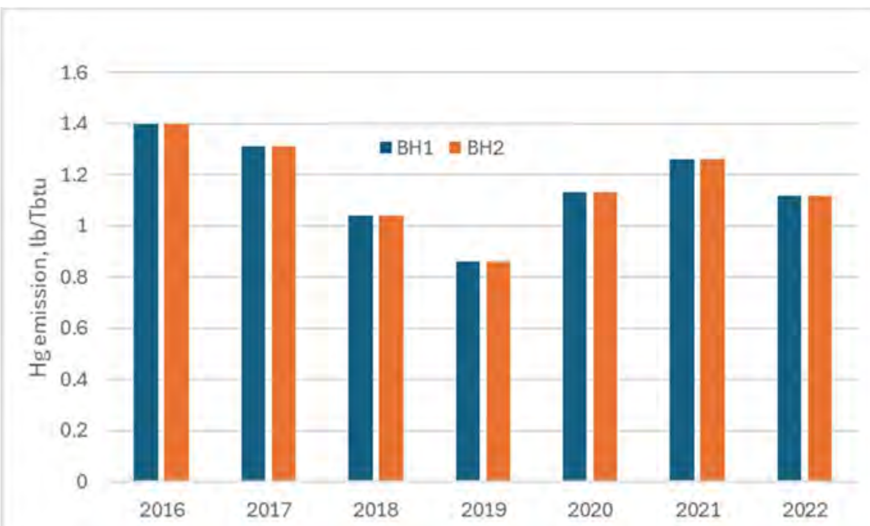
[70] *See* Google Patents, Calgon Carbon, https://patents.google.com/patent/EP2956230B1/en?assignee=calgon+carbon&oq=calgon+carbon (describing a carbon offered by Calgon Carbon that is used); Google Patents, ADA Carbon Solutions, https://patents.google.com/patent/US20140191157A1/en?assignee=ada+carbon+solutions&oq=ada+carbon+solutions&page=1 (Arq: FastPAC Premium 80). *See also* ATP 2021 at 48-51.

Configuration

55. Importantly, none of the lignite facilities are the most difficult configuration to control for Hg – unscrubbed, pulverized coal (or cyclone) units with only an ESP for fPM control. There are numerous[71] bituminous units with this configuration, and they have been controlled to under 1.2 lb/TBtu for years. No lignite units have this, most challenging, configuration.

56. The significance of having a favorable configuration is illustrated by the lignite-fired Red Hills Generating facility. EIA Form 923 reported Hg emissions for Red Hills Generating facility for 2016 through 2022 showed rates under 1.2 lb/TBtu in the years 2018, 2019, 2020, and 2022, as shown in Figure 11. A database of coal-fired power plants developed by Natural Resources Defense Council[72] provided roughly consistent data.

Figure 11. Hg emission rates for Red Hills Generating[73]



[71] NEEDS v6 showed 27 unscrubbed, operating bituminous units equipped with cold-side ESPs.
[72] A database of coal-fired power plants developed by Natural Resources Defense Council indicated 2020 average emission rate at Red Hills Generating facility averaged 1.041 lb/TBtu for unit 1 and 1.15 lb/TBtu for unit 2. NRDC, Coal-Fired Power Plant Hazardous Air Pollution Emissions and Pollution Control Data, https://www.nrdc.org/resources/coal-fired-power-plant-hazardous-air-pollution-emissions-and-pollution-control-data.
[73] Data from EIA Form 923.

57. This is significant because this is under the 1.2 lb/TBtu level and Red Hills has the *highest Hg content* coal of the lignite units for which EIA Form 923 Hg data was available. The Red Hills lignite-fired facility in Mississippi is a circulating fluid bed facility with a fabric filter, which is a configuration that responds very well to activated carbon for Hg control because of the high free lime and the high capture possible with a fabric filter. In 2020 these units were operating with "Refined Coal", which in this case is treated lignite coal designed to mitigate Hg, SO_2 and NOx emissions. According to the NRDC database, two other lignite units achieved under 2.0 lb/TBtu that year, Dolet Hills and Lewis and Clark plants.

58. All lignite units have favorable configurations for Hg control. Every lignite unit is either equipped with a fabric filter, dry FGD with fabric filter, or wet FGD in combination with either a fabric filter or ESP. The unscrubbed units with fabric filters are fluid bed combustors, and therefore have very high free lime in the fly ash and therefore low SO_3 content in the flue gas. Furthermore, for units with fabric filters, ACI is highly effective for capture of Hg. Therefore, units with fabric filters alone or in combination with wet or dry FGD can achieve very high Hg capture in a consistent manner. Units with ESPs followed by a wet FGD are also capable of achieving high capture efficiency on a consistent basis because wet FGD systems are capable of high Hg capture, and especially when used in combination with ACI. Wet FGD is extremely effective in capturing oxidized mercury, as demonstrated by the low Hg emissions achieved at the Conemaugh plant despite the high Hg content of the coal used there.

2. *Other issues regarding Hg control raised in Attachment B, the Cichanowicz report*

59. The Cichanowicz report[74] argues that the annual Hg rate used by EPA does not factor the 30-day rolling average or account for variability. It then gives examples of situations where some daily averages exceeded 1.2 lb/TBtu. The data shows that the facilities with the lowest number of variances are those with fabric filters, dry scrubbers, or lignite units with wet FGD. All of the lignite units are either equipped with a baghouse, a dry scrubber with baghouse, or wet FGD in combination with ESP or baghouse. As a result, the lignite units are likely to be well controlled in a relatively consistent manner.

60. Section 7.2 of the Cichanowicz report discusses a wide range of factors that may or may not impact Hg capture. At this point in time, Hg capture has been performed in the United States for nine years under the MATS rule. If state rules are considered, Hg has been controlled at some coal fired power plants for much longer than this – about 20 years in some cases. In this time, a great deal has been learned about the various factors that impact Hg control, and companies know how to address each of the factors identified in the Cichanowicz report.

Refined coal

61. Refined coal refers to coal that is treated to reduce emissions (typically with chemicals that may include bromine for oxidizing Hg) and must offer *" . . . a reduction of at least 20 percent of the emissions of nitrogen oxide (NOx) and at least 40 percent of the emissions of either sulfur dioxide (SO2)*

[74] pages 8-13 of the Cichanowicz report

or mercury (Hg) released when burning the refined coal (excluding any dilution caused by materials combined or added during the production process), as compared to the emissions released when burning the feedstock coal or comparable coal predominantly available in the marketplace as of January 1, 2003;"[75]

62. Refined coal, due to tax code provisions, once received beneficial tax treatment. The Cichanowicz report states that this is "no longer a viable option". There is no technical reason why utilities cannot continue to treat the coal, although the tax benefit is no longer available. In fact, some facilities add bromine to their coal without the tax benefit associated with refined coal. Simply adding bromine, as practiced by some facilities, would not have qualified for refined coal provisions because bromine only addresses Hg. But, this could be performed to improve Hg capture.

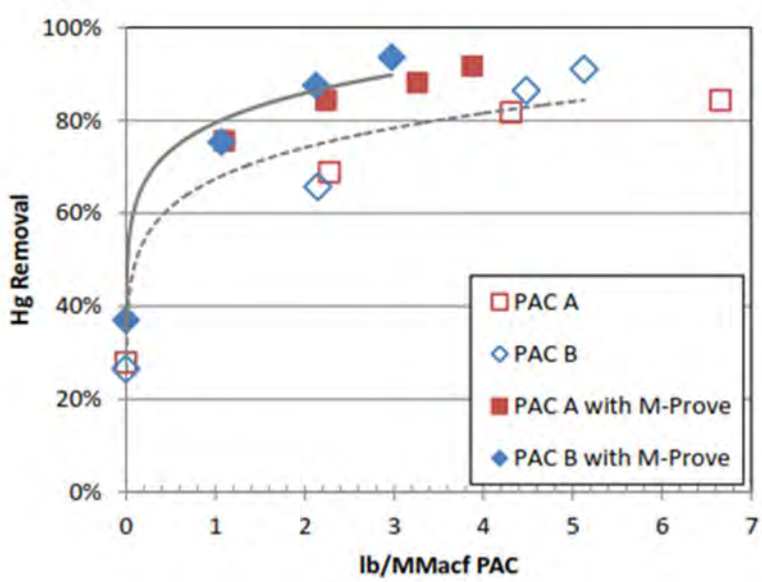
Sorbent Injection

63. Sorbent injection has been deployed on hundreds of coal-fired boilers under a very wide range of coal types, plant configurations and operating conditions. Some of these applications go back to over 20 years ago. Therefore, the statement in the Cichanowicz report that, "*Devising a reasoned prediction of Hg removal under variable conditions, including coal composition and the impact of changing sorbents is not possible with current available information"* suggests that little has been learned over these past 20 years and hundreds of coal power plant applications. To make this point, the Cichanowicz report cites tests at the Labadie plant, but it does not present the Labadie results. The Labadie test results, presented in the

[75] IRS, Production Tax Credit for Refined Coal, Notice 2009-90, https://www.irs.gov/pub/irs-drop/n-09-90.pdf.

2016 Mega Symposium cited by Cichanowicz, demonstrate that for given sorbent types and additives ("M-Prove" technology, in this case), the emissions performance in fact follows predictable trendlines, as shown in Figure 12. This testing was for the purpose of demonstrating the effects of additives and carbon types on improving treatment rate of brominated activated carbon. Indeed, the presentation stated that the additives demonstrated that effect. What the cited document therefore indicates is that – back in 2016 – the impact of changing sorbents or using additives was well understood. Technology suppliers had by 2016 developed means to enhance the performance of activated carbon. They had also identified the key variables impacting performance, permitting higher Hg capture in a predictable way.

Figure 12. Comparison of Mercury Removal with and without M-Prove Technology as a Function of PAC Injection Rate[76]



[76] Senior, C. et. al., "Reducing Operating Costs and Risks of Hg Control with Fuel Additives", Presentation to the Power Plant Pollutant Control and Carbon Management Mega Symposium, August 16-18, 2016.

SCR, FGD Co-Benefits

64. Many units do not need to rely primarily upon ACI for Hg control and can utilize what some call "co-benefit" Hg capture from control systems designed to capture other pollutants. Oxidized Hg is very efficiently captured in a wet FGD scrubber. SCR has the potential to oxidize Hg upstream of a wet FGD where it can be captured more efficiently. This is a phenomenon that has been examined since 2004 at the latest.[77] Companies incorporate this knowledge into their SCR catalyst management plans.[78] In fact, the Electric Power Research Institute (EPRI) developed and published in 2016 the results of their predictive modeling of Hg oxidation from SCR catalysts that showed high agreement between predicted and actual results.[79] This phenomenon, examined for close to two decades, is well understood and utilities incorporate this into their Hg compliance already. One lignite coal plant (Oak Grove in Texas) is currently equipped with SCR. It is uncertain if SCR will be installed on other lignite coal plants in the future.

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[77] *See* Renninger, S., Farthing, G., Ghorishi, S.B., Teets, C., Neureuter, J., "Effects of SCR Catalyst, Ammonia Injection and Sodium Hydrosulfide on the Speciation and Removal of Mercury within a Forced-Oxidized Limestone Scrubber", Joint EPRI DOE EPA Combined Utility Air Pollution Control Symposium, The Mega Symposium, Washington, D.C., August 30-September 2, 2004; Winberg, S., Winthum, J., Tseng, S., Locke, J., "Evaluation of Mercury Emissions from Coal-Fired Facilities with SCR-FGD Systems", DOE/NETL Mercury Control Technology R&D Program Review, Pittsburgh, PA, July 14-15, 2004; Senior, C.L, and Linjewile, T., "Oxidation of Mercury Across SCR Catalysts in CoalFired Power Plants", DOE/NETL Mercury Control Technology R&D Program Review, Pittsburgh, PA, July 14-15, 2004; U.S. Environmental Protection Agency, Air Pollution Prevention and Control Division, National Risk Management Research Laboratory, Office of Research and Development, "Control of Mercury Emissions from Coal Fired Electric Utility Boilers: An Update", Research Triangle Park, NC, February 18, 2005.

[78] Rutherford, S., Reeves, C., "SCR Catalyst Management for Optimal NOx and Hg Emissions control", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016.

[79] Hinton, S., et al., "SCR Mercury Oxidation Modeling Efforts", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016.

Hg Re-Emission

65. This phenomenon was first identified in the 1990's[80] and relates to the now well-understood effect that wet scrubber chemistry has on the fate of Hg that is captured. Early testing of wet FGD Hg capture found that in some cases elemental Hg would be released at higher levels than inlet levels, suggesting "re-emission" of captured Hg – oxidized Hg that had been captured in scrubber liquor could undergo a reduction reaction to form elemental Hg and then be released. This phenomenon is now well understood thanks to research, and methods have been developed to address it. The role of oxidation reduction potential (ORP) has been identified as a major factor in this phenomenon as well as sulfite chemistry. Management of ORP is one way to address Hg re-emission.[81] Other means of managing this that have been developed include use of sorbents to control Hg reemission,[82] sulfite control[83] and even flocculants to increase precipitation of Hg-containing solids. Since most of the lignite units have wet scrubbers, they will be

[80] Gadgil, M., "20 Years of Mercury Re-emission – What Do We Know?", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016.
[81] *See* Blythe, et al., "Investigation of Toxics Control by Wet FGD Systems", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016; Blythe, et al., "Maximizing Co-benefit Mercury Capture for MATS Compliance on Multiple Coal-Fired Units", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016; Steen, W., Blythe, et al., "Correlating FGD Oxidation-Reduction Potential Using Multivariate Data Analysis Techniques: A Path to Understanding Governing Behavior and Control Options", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016.
[82] Pavlish, J., Lentz, N.., "Managing Mercury Scrubber Reemission and Maintaining MATS Compliance Using a Sorbent Approach", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016.
[83] Patton, et. al., "WFGD Sulfite Control Testing at Seminole electric's Palatka Station Reduces Hg Re-emissions and Improves Trace Element in Purge Stream", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016.

capable of capturing Hg in the scrubber with the benefit of the knowledge gained over the past nearly three decades.

Variability Due to Load Changes

66. The Cichanowicz report also cites 2016 documents that show that there is risk of Hg re-emission from wet FGD systems or changes in capture efficiency when there is a load change and ORP may change.[84] These 2016 documents also demonstrate that this effect is understood and methods to address them were being shown to be effective in 2016. These papers discuss the use of ORP, sulfite additives, or addition of sorbents to address the risk of Hg re-emission at different conditions, including load changes.

B. Cichanowicz criticism of EPA ESP upgrade cost information

67. The Cichanowicz report incorrectly categorizes the project at Labadie power plant Units 1 & 2 as an ESP upgrade.[85] It is, in fact, an ESP replacement project performed on half of the facility. ESP upgrade types are described in ATP 2021.[86] To be specific, an ESP upgrade utilizes the existing ESP casing and structure. When these are replaced, it is an ESP replacement. Ameren identified the project as replacement (not an upgrade) in their comments.[87] In Ameren's words, "Ameren retrofitted the entire ESP trains

[84] *See* Blythe, et al., "Investigation of Toxics Control by Wet FGD Systems", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016; Blythe, et al., "Maximizing Co-benefit Mercury Capture for MATS Compliance on Multiple Coal-Fired Units", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016; Pavlish, J., Lentz, N.., "Managing Mercury Scrubber Reemission and Maintaining MATS Compliance Using a Sorbent Approach", Power Plant Pollutant Control and Carbon Management "MEGA" Symposium, August 16-18, 2016.
[85] page 17 of Cichanowicz report
[86] ATP 2021 at 16-23.
[87] Ameren Missouri comments submitted to Docket EPA-HQ-OAR-2018-0794 (hereinafter "Ameren comments"), https://www.regulations.gov/comment/EPA-HQ-OAR-2018-0794-5973.

on two units in 2014/2015. On each of these units, two of the three original existing ESPs had to be abandoned and one of the existing ESPs was retrofitted with new power supplies and flue gas flow modifications. A new state-of the art ESP was added to each unit to supplement the retrofitted ESPs."[88] These units are shown in Figure 13. Because these are new ESPs, with most of the existing structure abandoned, the cost is greater than the cost of an ESP upgrade, approaching the cost of a fabric filter retrofit.

Figure 13. New ESPs at Labadie units 1 & 2 and adjacent units 3 & 4 with older ESPs.[89]

68. The way the cost estimates were developed by EPA (as well as by ATP in ATP 2023), facilities that are expected to be unable to reduce PM emissions sufficiently with an ESP upgrade to meet the limit are estimated to install a fabric filter. Apparently, Ameren, the owner of Labadie, determined that an

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[88] *Id.*
[89] From Google Earth.

ESP upgrade would not be sufficient for the two units to get the full, four-unit facility in compliance, and they chose a more expensive approach for Units 1 & 2, and comply with a facility average, avoiding any cost on the other two units. At $149/kW and $163/kW (2014 dollars), respectively, per unit[90] the Unit 1 and Unit 2 ESP replacement projects approached the cost of a fabric filter on each of the units. As will be shown in the following paragraph, installing new ESPs on Labadie Units 1 & 2 enabled Ameren to comply with MATS at the full Labadie plant by making modifications to half of the plant capacity rather than the entire plant.

69. The Labadie project illustrates an aspect of the MATS rule that reduces cost - plant averaging – that makes the rule more economical. Ameren was able to comply with MATS on all four Labadie units through modifications at two of the four units at the Labadie plant. Because these retrofits enabled the full, roughly 2,400 MW, plant to comply with the MATS rule (as opposed to only the roughly 1,200 MW that were retrofit with new ESPs), the cost on a $/kW basis for MATS compliance was in fact roughly half of what would be calculated when using only the two units that were retrofit. When the cost is averaged over the entire facility, the capital cost on a $/kW basis is on the order of EPA's assumed cost for a major ESP upgrade.

70. The costs for the AES Petersburg ESP upgrade identified in the Cichanowicz report are roughly equivalent to the cost assumed by EPA for major ESP upgrades. This demonstrates that EPA's assumptions for ESP upgrades are consistent with industry data.

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[90] Ameren comments. Further, this cost only applies to the two affected units. Since the new ESPs brought the full plant into compliance due to plantwide averaging, the cost on a $/kW basis should be half of this.

71. Given the above information, and data from other sources (see ATP 2021 and ATP 2023), the cost estimates used by EPA for ESP upgrades that were developed by Sargent & Lundy and utilized by EPA are similar to the costs that are independently presented in ATP 2021 and ATP 2023.

C. Contrary to what Mr. Bohrer believes, there is ample capacity to address any needed ESP modifications.

72. As noted earlier in this declaration, there will be adequate skilled labor to address any need for improving the performance of ESPs. EPA forecast 4 ESP rebuilds, 1 minor ESP upgrade, 4 typical ESP upgrades, and two fabric filter installations.[91] Other changes amounted to upgrades of filter bag material, increased O&M, or increased filter bag replacement frequency. Mr. Bohrer expressed concerns that four vendors might not be capable of performing the work in 3 years.[92] As noted earlier, the industry has managed to respond to other rules that entailed many more projects, and far more complex projects than envisioned from this rule. As noted earlier in this declaration, I do not expect there to be any risk of industry not being able to respond to the requirements of this rule. Sargent & Lundy has estimated that fabric filters can be installed within two years.[93] A fabric filter installation is a more extensive project than the most extensive ESP rebuild and would be even greater scope than an ESP replacement. So, an ESP rebuild, if needed, can be performed in under two years.

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[91] *See* EPA-HQ-OAR-2018-0794-6919_attachment_1.
[92] Exhibit 9, Declaration of Jason Bohrer, ¶ 23 in *National Rural Electric Coop. Assn. v. EPA*, No. 24-1179, Motion for Stay (D.C. Cir., June 21, 2024).
[93] Sargent & Lundy, "IPM Model – Updates to Cost and Performance for APC Technologies Particulate Control Cost Development Methodology", Final, April 2017, Project 13527-001, page 10.

D. Response to Mr. McLennan and reports on MRY power plant

73. Mr. McLennan and Minnkota Power Cooperative included two reports about the MRY plant that were prepared by Sargent & Lundy Corporation.[94] One is a May 2023 report "Mercury Testing Results for the MATS Residual Risk and Technology Review." The other is a June 2023 report, "Particulate & Mercury Control Technology Evaluation & Risk Assessment for Proposed MATS Rule." MRY plant has two units – one around 237 MW and the other about 447 MW. They are cyclone boilers equipped with cold-side ESPs, ACI and wet scrubbers. They are also equipped with SNCR for NOx control. As scrubbed units, they can capture Hg in the ESP while using ACI. Hg can also be captured in the wet scrubber. So, MRY has more options for Hg control than an unscrubbed facility with an ESP for PM control.

74. MRY was only able to test up to the limit of their current ACI system injection capacity. Therefore, the testing that was performed is not especially instructive. None of the testing explored increasing capture in the wet scrubber, which is widely known to be highly effective in capturing oxidized Hg.

75. Sargent & Lundy concluded that the existing system cannot meet the new, lower emission rate simply by increasing carbon injection to the limit of what the existing system is capable of. However, the June report (Attachment E) did identify the fact that the Hg was primarily in the elemental form. This is typical for lignite units due to the low halogen content of most lignite coals. Because of this, increasing oxidation of

[94] *See* Attachments A and E to Exhibit 9, Declaration of Robert McLennan, at 167 and 249 in *North Dakota v. EPA*, No. 24-1119, Amended Motion for Stay (D.C. Cir., June 7, 2024).

mercury through halogen addition would facilitate more capture in the ESP and especially the wet scrubber, which Sargent & Lundy stated can capture 90% of oxidized Hg.[95] Sargent & Lundy also identified other means to improve capture through ACI, such as increasing carbon injection capacity, improving ACI contact and testing other carbons or additives.

76. Sargent & Lundy acknowledged that additional testing could explore controlling Hg to 1.2 lb/TBtu (pages 10-12). They did not rule out the possibility, and as previously noted, identified methods that could be used to increase capture with ACI and with the scrubber.

COMMENTS BY PURVIS – EAST KENTUCKY POWER COOPERATIVE

77. Mr. Purvis (para 21) states that Spurlock unit 3 is not presently capable of meeting the new fPM limit on a sustained basis.[96] He claims that the baghouse is undersized to achieve the fPM limit. He states that a single hole the size of a human pinky finger in one of the bags could cause an exceedance of the new standard (para 25).

78. A failure of roughly a square inch (about the area of a pinky finger) may not sound like much. But, it is, in fact, a fairly significant failure. ATP's 2021 report[97] discusses the important mechanisms for bag failure. Use of a fPM CEMS will help identify possible filter material deterioration and the potential for more significant future failure. As discussed in ATP's 2021 report, options for extending bag life include changing to more durable

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[95] Attachment E to Exhibit 9, Declaration of Robert McLennan in *North Dakota v. EPA*, No. 24-1119, Amended Motion for Stay at 10-11 (D.C. Cir., June 7, 2024).
[96] Exhibit 4, Declaration of Jerry Purvis in *National Rural Electric Coop. Assn. v. EPA*, No. 24-1179, Motion for Stay at 11 (D.C. Cir., June 21, 2024).
[97] Staudt, J., *Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants, for* Center for Applied Environmental Law and Policy (CAELP), August 19, 2021, page 26.

fabrics and managing cleaning frequency. Some of the more cleanable fabrics and more durable fabrics became more available after 2012. EPA did account for both increased diligence and the potential for increased filter media replacement frequency or replacement with higher performance fabrics.

79. EPA's analysis suggests that Spurlock 3's 99th percentile emission rate was below 0.010 lb/MMBtu for most quarters. So, it appears that Spurlock 3 can be brought into compliance with additional diligence.

Respectfully submitted:

James E. Staudt

July 18, 2024

ATTACHMENT 1

ATTACHMENT 1.

James E. Staudt, Ph.D., CFA
Andover Technology Partners
1 Surf Village Unit B, Manchester-by-the-Sea, MA 01944

Summary: A consultant with decades of experience assisting companies, government agencies and non-government organizations that work in the energy and environmental sector. Engagements typically require a deep knowledge of technology and business. Dr. Staudt has published numerous technical papers and reports on regulatory requirements, emissions control technology, and clean energy.

2019: Adjunct Professor, University of Massachusetts, Lowell
Teaching undergraduate engineering courses

2018: Adjunct Professor, Merrimack College
Developed syllabus and taught a new course in Engineering Economics for students in the Master of Science in Engineering Management program administered by the Mechanical Engineering department. Also taught Materials Science.

2013 – Present
Volunteer reviewer for the Mass Ventures START venture funding program for the Commonwealth of Massachusetts. START is a program funded by the Commonwealth of Massachusetts to assist Massachusetts-based companies that have been successful in the Federal Small Business Innovation Research (SBIR) program.

1997 – Present
President, Andover Technology Partners
Provided consulting services to:

United States and state government agencies in development of clean air and clean energy regulations. Regulatory actions that were developed using Dr. Staudt's analysis include

US EPA Proposed Mercury and Air Toxics Standards (MATS) Revision[98]
US EPA Affordable Clean Energy Rule
US EPA Clean Power Plan
US EPA NOx SIP Call
US EPA Clean Air Interstate Rule
US EPA Clean Air Mercury Rule

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[98] Work is cited at 40 CFR Vol. 88, No. 78, 24868 and 869

US EPA Regional Haze Rule[99]
Illinois Mercury Rule and NOx RACT rule
Consent Decree between US EPA, State of North Carolina and Tennessee Valley Authority
US EPA Cross State Air Pollution Rule
US EPA Mercury and Air Toxic Standards
National Emission Standards for Control of Hazardous Air Pollutants for
Portland Cement Kilns
Industrial Boilers
Pulp and Paper Mills
Iron and Steelmaking Facilities
Review of numerous stationary source permits in a range of industrial sectors

Environmental Non-Government Organizations
Developed numerous reports for these organizations or provided consulting services to them.

Developers of clean air or clean energy technologies
Market and industry strategy analysis

Owners of industrial facilities
Assisting clients in implementing and maintaining compliance, to include selecting and deploying emissions control technologies

Investors in companies in clean air or clean energy technology space
Assisting clients with evaluating investments in clean energy or clean air technology companies

1995-1997

Vice President, Spectrum Diagnostix (a subsidiary of Physical Sciences, Inc.) - Managed technology development and commercial operations for developer of diode laser based optical process instrumentation. Company was sold in 1997.

1990-1995

Product Director, NOx Control, Research-Cottrell – Managed engineering, operations, and sales of pollution control technologies to power plants and large industrial facilities

1990

[99] Cited 143 times in 40 CFR Vol. 79, No. 20, pp 5032-5222

Physical Sciences, Inc. – Managed a US Department of Energy research program on energy. Developed business plan for what would later become Spectrum Diagnostix.

1988-1990

Programs Manager, Fuel Tech, Inc., Managed chemical process engineering group and commercial demonstration programs for air pollution control technology used at power plants and large industrial facilities.

1987-1988

Project Manager, Northern Research and Engineering Corporation. – Project manager for a turbomachinery design company owned by Ingersoll Rand.

1984-1987

Graduate student, Massachusetts Institute of Technology

1979-1984

US Naval Officer – Navy nuclear program

Publications

Dr. Staudt has published over 70 papers, journal articles or publicly available reports. In addition, he has also authored many reports for US EPA and other clients as part of his consulting practice that have been released to the public under the client's name.

Education and Professional Credentials

B.S. in Mechanical Engineering from the U.S. Naval Academy (1979)
M.S. (1986) in Engineering from the Massachusetts Institute of Technology (M.I.T.)
Ph.D. (1987) in Engineering from the Massachusetts Institute of Technology (M.I.T.) with a minor in Business Management
Chartered Financial Analyst (CFA) designation (2001)
US Navy Chief Engineer, nuclear power (1983)

Awards

2007 US Environmental Protection Agency Science and Technology Achievement Award

Providing the Public with a Comprehensive Summary of Technologies for Control of Mercury Emissions from Electric Utility Boilers

1994 and 2010 Institute of Clean Air Companies (ICAC) Special Achievement Awards

Professional Associations

Member, CFA Institute

Military Service

From 1979 to 1984 Dr. Staudt served as a commissioned officer in the U.S. Navy in the Engineering Department of the nuclear-powered aircraft carrier USS ENTERPRISE (CVN-65), attaining the rank of Lieutenant (O-3) prior to leaving the service.

Publications

1. Staudt, J., *Compliance Options Available to Individual Power Plants Under the Proposed Clean Air Act Section 111 GHG Rules,* December 18, 2023.
2. Staudt, J., *History of Flexible Compliance with Science-Based and Technology-Based Stationary Source Air Pollution Regulations,* December 18, 2023.
3. Staudt, J., *CO_2 and NOx Emissions from Natural Gas Combined Cycle and Natural Gas Combustion Turbine Power Plants,* September 23, 2023.
4. Staudt, J., *Assessment of Potential Revisions to the Mercury and Air Toxics Standards*, for Center for Applied Environmental Law and Policy, June 15, 2023
5. Staudt, J., *Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants – Addendum*, Analysis of the Cost of Complying with Lower Hg Emissions Levels, for Center for Applied Environmental Law and Policy (CAELP), January 5, 2023
6. Staudt, J. *Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants*, for Center for Applied Environmental Law and Policy (CAELP), April 5, 2022 available at: https://www.andovertechnology.com/articles-archive/
7. Staudt, J., *Natural Gas Cofiring for Coal-Fired Utility Boilers*, for Center for Applied Environmental Law and Policy (CAELP), February 12, 2022, available at: https://www.andovertechnology.com/articles-archive/
8. Staudt, J., *Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants*, for Center for Applied Environmental Law and Policy (CAELP), August 19, 2021; available at: https://www.andovertechnology.com/articles-archive/
9. Staudt, J., and Glesmann, S., White Paper – "The Past, Present, and Future of Smart Building Management", May 2020, available at: https://www.andovertechnology.com/articles-archive/
10. Staudt, J., "Heat rate measurement using Continuous Emission Monitoring Systems (CEMS) and comparison with fuel use data", Electric Power

Research Institute (EPRI) Meeting on Continuous Emission Monitoring Systems, May 2-3, 2018, Saint Louis

11. Staudt, J., “Using Publicly Available Heat Rate Data”, Electric Power Research Institute (EPRI) Meeting on Improving Power Plant Heat Rate, February 21-23, Atlanta
12. Staudt, J., “Examination of uncertainty in heat rate determinations”, Presented at the Power Plant Pollutant Control “MEGA” Symposium, August 16-18, 2016, Baltimore, MD
13. Staudt, J., “Natural Gas Conversion and Cofiring for Coal-Fired Utility Boilers”, for Environmental Defense Fund, November 2014
14. Staudt J., Macedonia, J., “Evaluation of Heat Rates of Coal Fired Electric Power Boilers”, Presented at the Power Plant Pollutant Control “MEGA” Symposium, August 19-21, 2014 , Baltimore, MD
15. Staudt, J. “Assessment of Bias in Measurement of Mercury Emissions from Coal Fired Power Plants – Comparison of Electronic CEMS and Sorbent Traps”, Presented at the 10th Annual 10th IEA Mercury Emission from Coal Workshop, Clearwater, FL, April 23-25, 2014
16. Staudt, J., “Candidate SO_2 Control Measures for Industrial Sources in the LADCO Region”, for Lake Michigan Air Director’s Consortium, January 24, 2012.
17. Staudt, J., “Engineering and Economic Factors Affecting the Installation of Control Technologies– An Update”, for US EPA Clean Air Markets Division, December 15, 2011
18. Staudt, J., “Air Pollution Compliance Strategies for Coal Generation”, EUCI, Arlington, VA, December 5-6, 2011 available at www.AndoverTechnology.com
19. Staudt, J., ”Labor Availability for the Installation of Air Pollution Control Systems at Coal Fired Power Plants” , October 31, 2011, at www.AndoverTechnology.com
20. Staudt. J. and M J Bradley & Associates, for the Northeast States for Coordinated Air Use Management, “Control Technologies to Reduce Conventional and Hazardous Air Pollutants from Coal-Fired Power Plants”, March 31, 2011
21. Staudt, J., “Surviving the Power Sector Environmental Regulations”, The Bipartisan Policy Center's, National Commission on Energy Policy (NCEP), Workshop on Environmental Regulation and Electric System Reliability, Washington, DC October 22, 2010
22. Staudt, J., “White Paper – Availability of Resources for Clean Air Projects”, October 1, 2010, abstract available at: www.AndoverTechnology.com

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25. Staudt, J., "Commercializing technologies: The buyer's perspective - Experience from the Clean Air Act", 3rd US Carbon Finance Forum, New York City, September 15-16, 2009
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27. Staudt, J., Erickson, C., "Selective Catalytic Reduction System Performance and Reliability Review – An Update", Power Gen, Orlando FL, December 2-4, 2008
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29. Erickson, C., Staudt, J., "Selective Catalytic Reduction System Performance and Reliability Review", EPA-EPRI-DOE Combined Utility Air Pollution Control Symposium – The Mega Symposium, Baltimore, MD, August 28-31, 2006
30. Srivastava, R., Hutson, N., Princiotta, F., Martin, G., Staudt, J., "Control of Mercury Emissions from Coal-Fired Electric Utility Boilers", *Environmental Science & Technology*, 41(5):1385-1393 (2006)
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33. Srivastava, R., Staudt, J., and Jozewicz, W., "Preliminary Estimates of Performance and Cost of Mercury Emission Control Technology Applications on Electric Utility Boilers: An Update", *Environmental Progress*, Wiley Interscience, Volume 24, No. 2, July 2005, pp. 181-197.

34. Staudt, J., Khan, S., Oliva, M., "Reliability of Selective Catalytic Reduction (SCR) and Flue Gas Desulfurization (FGD) Systems for High Pollutant Removal Efficiencies on Coal Fired Utility Boilers", presented at the EPA-EPRI-DOE Combined Utility Air Pollution Control Symposium – The Mega Symposium, August 30-September 2, 2004, Washington, DC, Paper # 04-A-59-AWMA
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38. Staudt, J., "Optimizing Compliance Cost for Coal-Fired Electric Generating Facilities in a Multipollutant Control Environment", Proceedings ASME Power 2004, ASME Power Conference, Baltimore, Maryland, March 30 - April 1, 2004
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41. Staudt, J.E., Engelmeyer, A., "SCR Catalyst Management – Modeling and Experience", presented at Coal Gen, August 6-8, 2003, Columbus, OH
42. Staudt, J.E., Engelmeyer, A., "SCR Catalyst Management – Modeling and Experience", presented at the EPA-EPRI-DOE Combined Utility Air Pollution Control Symposium – The Mega Symposium, May 20-25, 2003, Washington, DC, Paper # 03-A-57-AWMA
43. Staudt, J.E., Jozewicz, W., Srivastava, R., "Modeling Mercury Control with Powdered Activated Carbon" presented at the EPA-EPRI-DOE Combined Utility Air Pollution Control Symposium – The Mega Symposium, May 20-25, 2003, Washington, DC, Paper # 03-A-17-AWMA
44. Staudt, J.E., "NOx Emissions Trading Markets – An Approach for Using Them In Your Strategic Planning", DOE SCR/SNCR Conference,

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55. Staudt, J.E., "Post-Combustion NOx Control Technologies for Electric Power Plants", A&WMA Annual Meeting, Nashville, TN, June 23-28, 1996.
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64. Benson, C., Staudt, J. E. and Itse, D. C., "Controlling Emissions from Stationary Coal-Fueled Diesel Engines", Contractor's Meeting, Morgantown Energy Technology Center, 1991.
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73. Staudt, J.E., Toqan, M.A., Srinivasachar, S., Beér, J.M., and Tear, J.D., "Fly Ash Particle Size in CWF Flames", Presented at the Eighth International Symposium on Coal Slurry Fuels Preparation and Utilization, Orlando, May 27-30, 1986.
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Government and Public Sector Consulting Projects

Title: Support to US EPA – Clean Air Markets Division
Client: EPA Clean Air Markets Division through ERG
Scope: Supporting US EPA, performing various analysis as needed.
Period of Performance: 2019-present

Title: Assistance on Affordable Clean Energy Plan
Client: EPA Clean Air Markets Division through ERG
Scope: Performed analysis of labor impacts of heat rate improvements and clean energy technologies.
Period of Performance: 2018-2019

Title: Assistance on Clean Power Plan
Client: Navajo Nation, through Navajo Tribal Utility Authority
Scope: Assisting Navajo Nation with technical analysis of Clean Power Plan proposal, to include interaction with electric utility companies, analysis of compliance options and meetings with EPA Assistant Administrator for Air and Radiation.
Period of Performance: 2014-2015

Title: Impact to Labor Demand from Heat Rate Improvements on Existing Fossil Power Plants
Client: EPA Clean Air Markets Division through ICF International
Scope: A review of technical methods and potential labor impacts of heat rate improvements that might result from EPA regulation of Greenhouse Gases (GHGs) from existing fossil power plants.
Period of Performance: 2013-2014

Title: Best Available Retrofit Technology (BART) analysis and BART related support
Client: EPA Regions 8 and 9 - through EC\R and ICF International, respectively
Scope: Performed BART technology and cost analysis for industrial sources and electric generating units (visibility analysis performed by others). Also assisted EPA regions respond to comments, as needed. Industrial sources

included industrial boilers, cement kilns, lime kilns, combustion turbines, and reciprocating internal combustion engines.
Period of Performance: 2012-2016

Title: Candidate Control Measures for SO_2 Control from Industrial Sources
Client: Lake Michigan Air Directors Consortium (LADCO)
Scope: Performed a study and published a report that evaluated candidate SO2 control measures for a wide range of industrial sources in the LADCO region, to include: Industrial Boilers, Cement Kilns, Lime Kilns, Iron and Steel Mills, Refineries, Chemical Plants, Glass furnaces, and others. A report was published and is available on the LADCO website:
Period of Performance: 2011/2012

Title: Control Technologies to Reduce Conventional and Hazardous Air Pollutants from Coal-Fired Power Plants
Client: MJ Bradley and Associates and Northeast States for Coordinated Air Use Management
Scope: Prepared a report in collaboration with MJ Bradley and Associates on the topic of control technologies for control of NOx, SO2, and Air Toxics (particle matter, acid gases, mercury, etc.) for coal fired power plants and the application of these technologies for compliance with US EPA rules. A report was published by the Northeast States for Coordinated Air Use Management (NESCAUM).
Period of Performance: 2011

Title: Greenhouse Gas Mitigation Options Database (GMOD)
Client: US EPA (through Eastern Research Group and RTI International)
Scope: Developed Greenhouse Gas Technology Database for US EPA for power plants and cement kilns. Effort includes collection and analysis of data on performance and cost of various greenhouse gas control technologies including CO2 capture, IGCC, and others.
Period of Performance: Spring 2009-2010

Title: Emissions Control for Power Plants
Client: US EPA (through ICF Consulting)
Scope: Comprehensive evaluation of NOx, SO_2, and CO_2 emissions from power plants and development of capital cost, variable and fixed operating cost algorithms for control measures as well as impacts (energy use, water use,

emissions reduction) for use in the Integrated Planning Model. Assisted EPA with analysis for Mercury and Air Toxic Standards, to include analysis of Information Collection Request (ICR) Data to determine emission levels and controls needed for different sources. Also analyzed the availability of and demand for labor and other resources necessary for compliance with the MATS and Cross State Air Pollution Rule (CSAPR).
Period of Performance: Fall 2009-2012

Title: Emissions Control for Cement Kilns
Client: US EPA (through ICF Consulting and Eastern Research Group)
Scope: Comprehensive evaluation of NOx, SO_2, and CO_2 emissions from cement kilns, and development of capital cost, variable and fixed operating cost algorithms for control measures as well as impacts (energy use, water use, emissions reduction) for use in the US EPA Industrial Source Integrated Solutions (ISIS) Model.
Period of Performance: 2008-2010

Title: Emissions Control for Iron and Steel Mills
Client: US EPA (through Eastern Research Group)
Scope: Comprehensive evaluation of NOx, SO_2, and CO_2 emissions from Iron and Steel Mills, and development of capital cost, variable and fixed operating cost algorithms for control measures as well as impacts (energy use, water use, emissions reduction) for use in the US EPA ISIS Multi-Sector Model.
Period of Performance: 2009-2010

Title: Emissions Control for Pulp and Paper Mills
Client: US EPA (through RTI International)
Scope: Comprehensive evaluation of NOx, SO_2, and CO_2 emissions from Pulp and Paper Mills, and development of capital cost, variable and fixed operating cost algorithms for control measures as well as impacts (energy use, water use, emissions reduction) for use in the US EPA ISIS Multi-Sector Model.
Period of Performance: 2009-2010

Title: NOx Control – NOx RACT
Client: State of Illinois, Environmental Protection Agency, Bureau of Air (Contract with Lake Michigan Air Director's Consortium)
Scope: Providing technical support to the Illinois Environmental Protection Agency's Bureau of Air in developing rules for control of NOx at electric

generating units, gas turbines and reciprocating engines and steel mills, cement plants, glass-manufacturing plants, refineries, and other industrial facilities.
Period of Performance: 2007-2009

Title: Best Available Retrofit Technology for EGU's in Illinois
Client: State of Illinois, Environmental Protection Agency, Bureau of Air (Contract with Lake Michigan Air Director's Consortium)
Scope: Providing technical support to the Illinois Environmental Protection Agency's Bureau of Air in evaluating BART for specific IL EGUs.
Period of Performance: 2007-2008

Title: Air Pollution Reduction at Tennessee Valley Authority Plants
Client: Attorney General of North Carolina
Scope: Providing expert witness analysis of methods to reduce air pollution from TVA coal power plants.
Period of Performance: 2006-2008

Title: NOx and SO_2 Cost of Control under the Clean Air Act Amendments
Client: US Environmental Protection Agency and ICF Consulting
Scope: Providing technical support to the US EPA Clean Air Markets Division and analyzing the cost of compliance with Title IV (NOx and SO_2 Acid Rain provisions) of the Clean Air Act Amendments (CAAA) and the NOx SIP Call and OTC NOx Budget Rule that were issued under Title I of the CAAA.
Period of Performance: 2006

Title: Mercury Emissions Control
Client: State of Illinois, Environmental Protection Agency, Bureau of Air (Contract with Lake Michigan Air Director's Consortium)
Scope: ATP provided technical support to the Illinois Environmental Protection Agency's Bureau of Air in developing a rule to meet the Illinois Governor's proposed reduction in Illinois power plant mercury emissions.
Period of Performance: 2006 - completed

Title: Update of Coal Utility Environmental Cost (CUECost) Model
Client: US EPA and ARCADIS, P.O. Box 13109, Research Triangle Park, NC 27709
Scope: ATP developed cost and performance algorithms for mercury emissions control including cobenefits, powdered activated carbon and halogenated powdered activated carbon. Also developed SO_2 control cost and performance

algorithms. These and other updates were incorporated into EPA's CUECost model.
Period of Performance: 2005-2006

Title: SO_2 Control Cost and Performance
Client: US EPA and ICF Consulting, 9300 Lee Highway, Fairfax, VA 22031 (703) 934-3071
Scope: ATP supported ICF Consulting and US EPA in developing cost and performance models for limestone forced oxidation (LSFO) and Spray Drier Absorber technology that will be incorporated into the Integrated Planning Model. Reviews of installed installation data and vendor quotes was used to develop algorithms.
Period of Performance: 2005

Title: NOx Control Workshop, Dalian, China
Client: US Department of Energy, National Energy Technology Laboratory, and Arcadis
Scope: ATP developed and taught a workshop on NOx control methods, especially post combustion controls for coal-fired power plants, to Chinese delegates.
Period of Performance: 2005

Title: Reliability of Selective Catalytic Reduction (SCR) and Flue Gas Desulfurization (FGD) Systems for High Pollutant Removal Efficiencies on Coal Fired Utility Boilers
Client: US Environmental Protection Agency and ICF Consulting, 9300 Lee Highway, Fairfax, VA 22031 (703) 934-3071
Scope: ATP evaluated the reliability of recently installed SCR systems designed for very high removal efficiencies (over 90%) and also FGD technologies.
Period of Performance: 2004

Title: Performance and Cost of Mercury and Multipollutant Emission Control Technology Applications on Electric Utility Boilers, EPA-600/R-03/110 issued October 2003
Client: US EPA and ARCADIS, P.O. Box 13109, Research Triangle Park, NC 27709
Scope: ATP was the principal subcontractor to ARCADIS in evaluating the performance and cost of mercury and multipollutant control methods (NOx,

SOx, PM, Hg) for the US EPA. ATP developed cost and performance models to assess the emission control strategies for control of mercury, NOx, SO_2 and PM and other pollutants for about 50 model plants. Results are documented in EPA report EPA-600/R-03/110 issued October 2003, which may be downloaded from EPA's web site.
Period of Performance: 2002-2003

Title: Cost and Performance of Pollution Controls
Client: US EPA and ICF Consulting, 9300 Lee Highway, Fairfax, VA 22031 (703) 934-3071
Scope: As a subcontractor to ICF Consulting, ATP has evaluated the cost and performance of state-of-the-art combustion NOx controls and the cost and performance experienced with Selective Catalytic Reduction systems installed in response to the NOx SIP Call. Project entailed review of public information and interviews with industry contacts to collect cost and performance information, and reporting of the information to EPA and ICF.
Period of Performance: fall 2002 – fall 2003

Title: Engineering and Economic Factors Affecting the Installation of Control Technologies for Multipollutant Strategies, EPA-600/R-02/073, October 2002
Client: US EPA and ARCADIS, P.O. Box 13109, Research Triangle Park, NC 27709
Scope: As a subcontractor to ARCADIS, ATP analyzed the feasibility of complying with Multipollutant Control programs under evaluation by EPA. Report examined the feasibility of mercury, SO_2, and NO_X control technology implementation based upon forecasted technology installation schedules for the Clear Skies Initiative.
Period of Performance: Fall 2001 - Spring 2002

Title: Status Report on NOx Controls for Gas Turbines, Cement Kilns, Industrial Boilers, Internal Combustion Engines – Technologies and Cost Effectiveness
Client: Northeast States for Coordinated Air Use Management
Scope: Comprehensive report on technologies, performance and cost effectiveness of methods to control NOx from gas turbines, cement kilns, industrial boilers, and internal combustion engines.
Period of Performance: released December 2000

Title: Status Report on NOx Control Technologies and Cost Effectiveness for Utility Boilers
Client: Northeast States for Coordinated Air Use Management
Scope: Comprehensive report on technologies, performance and cost effectiveness of methods to control NOx from utility boilers.
Period of Performance: released December 2000

Industrial Consulting Projects

Client: Constellation Energy
Scope: Advised client on air pollution control technologies for use at Constellation power plants.
Period of Performance: 2006 - 2009

Client: Chase Power
Scope: Advised client on emission control technologies for use at proposed 1200 MW petroleum coke fired power plant.
Period of Performance: 2007/8

Client: Arizona Public Service Company
Scope: Advised client on emission control technologies for use at Arizona Public Service utility coal plants.
Period of Performance: 2003/2004

Client: GE Contract Services, Newington Energy, Newington, NH
Scope: Advised client on emission control technology issues relating to combined-cycle power plant with two GE Frame 7F combined cycle.
Period of Performance: 2003/2004

Client: Dick Corp. at AES Granite Ridge, Londonderry, NH
Scope: Advised client on emission control technology issues relating to combined-cycle power plant with two Siemens Westinghouse 501G combined cycle turbines.
Period of Performance: 2003/2004

Client: Wyeth Biopharma, One Burtt Road, Andover, MA 01810
Scope: Advised client on emission control technologies associated with client's gas turbine cogeneration facility equipped with Solar Taurus combined cycle turbines.
Period of Performance: fall 2000 - spring 2001

Client: Allegheny Energy
Scope: Advised client on cost-effectiveness of various methods of complying with emission control requirements at a PURPA Qualifying Facility in the Allegheny system. Support included technical evaluation of alternatives and economic analysis of alternative, including evaluation of allowance trading.

Services included expert witness testimony in an arbitration hearing.
Period of Performance: spring 2000

Client: Texas Industries
Scope: Performed a comprehensive technical analysis on the emission reduction process that is used on TXI and other cement kilns to increase production and reduce air pollution. Also advised TXI regarding emissions control methods for cement kilns.
Period of Performance: Fall 1999

Client: NRG Somerset Operations, 1606 Riverside Avenue, Somerset, MA 02726
Scope: Optimization of client's emission control system on coal-fired electric utility boiler. Significant improvements in system operation resulted from this program.
Period of Performance: 1999 through 2001

Client: Conectiv, Wilmington, DE
Scope: Optimization of client's emission control system on coal-fired electric utility boiler, including combustion tuning and consulting on SNCR operation.
Period of Performance: 1997, 1998, 2001, 2002

Client: PG&E Generating, 7500 Old Georgetown Road, Bethesda, MD 20814
Scope: Advised PG&E Generating on expected environmental upgrade costs on several electric generating plants that PG&E Generating was considering for acquisition.
Period of Performance: Spring 1999

Non Government Organizations

Client: Center for Environmental Law and Policy
Scope: Prepared reports on gas cofiring on coal-fired boilers, methods to improve PM and Hg emissions from coal-fired boilers, and methods to improve acid gas emissions from coal-fired utility boilers. Also published reports on US EPA's proposed revisions to the Mercury and Air Toxic Standards, and on US EPA's proposed Section 111 Greenhouse Gas Rule. Reports are available at www.AndoverTechnology.com
Period of Performance: 2020-2023

Client: Environmental Defense Fund
Scope: Various reports and engineering studies, to include gas conversion of coal-fired utility boilers.
Period of Performance: 2010-2021

Client: Natural Resources Defense Council
Scope: Various engineering studies to examine heat rate improvements on power plants, commenting on EPA regulations.
Period of Performance: 2010-2018

Client: Sierra Club
Scope: engineering studies to include evaluation of SO2 methods on select power plants.
Period of Performance: roughly 2018

DECLARATION OF ELSIE M. SUNDERLAND, PhD, HARVARD UNIVERSITY

I, Elsie M. Sunderland, state and declare as follows:

I. Purpose of this Declaration

1. This declaration explains that the public health benefits from controlling Hazardous Air Pollutant (HAP) emissions from US coal-fired electricity generating units (EGUs) are large, albeit largely unmonetized. While some of the health benefits of the revised Mercury and Air Toxics Standards and prior EPA actions have not been converted into monetary values, this does **not** mean there are no benefits as suggested by many parties. For example, prior to the phase out of leaded gasoline in the United States, the benefits of such actions for children's health were uncertain, and many were unmonetized initially, but later work clarified that such actions produced many billions of dollars in public health benefits.[1]

2. This declaration explains some of the scientific evidence for benefits of controlling HAP exposures that builds on decades of existing research. I focus primarily on the public health costs of mercury exposure from U.S. coal-fired EGUs, since less research has been conducted on EGU-attributable exposures to non-mercury HAP. I provide this discussion to emphasize the expected public

[1] J. Schwartz (1994). Societal benefits of reducing lead exposures. Environmental Research 66, 105-124.

health costs of any stay in the Final Rule for the National Emission Standards for Hazardous Air Pollutants Coal- and Oil- Fired Electricity Utility Steam Generating Units Review of the Residual Risk and Technology Review. 89 Fed. Reg. 35508 (May 7, 2024). This rule strengthens emission standards for mercury from lignite coal-fired electricity generating units (EGUs) from 4.0 lb/TBtu to 1.2 lb/TBtu and imposes a revised non-mercury HAP metal surrogate fine particulate matter (fPM) emission standard for EGUs of 0.010 lb/MMBtu, among other innovations. Importantly, these changes will address the immediate health risks associated with ongoing mercury emissions from lignite-fired EGUs, specifically in North Dakota and Texas, where there are many environmental justice communities who will benefit from the strengthened standards.

3. Changes in the mercury standards were based on the availability of new and improved technologies to control hazardous air pollutants (HAP). Direct comparison of EPA's costs and benefits is inappropriate because the quantified and monetized net benefits of this Final Rule for the period between 2028 and 2037 were incomplete. EPA did not monetize the direct health benefits of more stringent controls for mercury and non-mercury HAP, but this should not be conflated with zero public health benefits from controlling emissions. The damaging health effects associated with exposure to these toxicants are well established.

4. Any delay in implementation of this rule beyond the prescribed compliance period would cause unnecessary health risks for the affected populations surrounding lignite-coal fired EGUs, particularly in Texas and North Dakota, where the largest emitters of mercury remain (Oak Grove and Martin Lake, TX and Coal Creek, ND). A delay in compliance with updated standards, as may result from a stay of the rule if one is granted by the court, will cause unnecessary health risks.

5. I offer my opinions based on my professional experience working to examine the relationship between anthropogenic mercury emissions and human health impacts over the past three decades, as outlined in Section II.[2]

6. In preparing this document I reviewed the Final Rule, 89 Fed. Reg. 38,508, as well as the Regulatory Impact Analysis for the Final National Emission Standards for Hazardous Air Pollutants: Coal- and Oil- Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review.

II. Experience and Qualifications

7. I am the Fred Kavli Professor of Environmental Chemistry and Professor of Earth and Planetary Sciences at Harvard University. I am cross appointed in three schools at Harvard: (1) The Harvard John A. Paulson School of

[2] I did not receive any financial compensation for preparing this declaration.

Engineering and Applied Sciences, (2) The Harvard T.H. Chan School of Public Health, and (3) the Department of Earth and Planetary Sciences in the Faculty of Arts and Sciences. I have served on the Faculty at Harvard for the past 15 years. I worked as a scientist at the U.S. Environmental Protection Agency (EPA) for five years prior to this time.

8. While working for EPA, I helped to develop some of the modeling and analytical approaches that were eventually used in the Regulatory Impact Analysis for the Mercury and Air Toxics Standards (MATS) finalized in 2012, 77 Fed. Reg. 9304, although I have recommended many improvements to their methods in my subsequent research.[3] I was a key staff person at EPA supporting an earlier iteration of the rule between 2003-2006, for which I received a National Honor Award: Gold Medal for Exceptional Service. I have followed the progress of MATS closely since this time. Among my >150 total publications, I have co-authored more than 80 peer-reviewed papers on the environmental cycling, bioaccumulation and human exposure to mercury over my career in top journals

[3] E.M. Sunderland, C.T. Driscoll, K.F. Lambert, B. Geyman, C.P. Thackray, D. Evers, S. Goho. 2021. Mercury Science and the Benefits of Mercury Regulation. 2021. Harvard Chan C-CHANGE White Paper. Available: https://www.hsph.harvard.edu/c-change/wp-content/uploads/sites/2343/2021/12/Mercury_WhitePaper_121621.pdf.

such as *Science*,[4] *Nature*,[5] *Proceedings of the U.S. National Academy of Sciences*,[6] and *Environmental Science & Technology*.[7]

9. Of particular relevance to this rule, my recent research has included the development of a template for EPA to monetize the benefits of mercury emissions reductions[8] as well as the environmental justice implications of coal-fired EGUs across the United States.[9]

10. Among my recent professional service appointments, I served as an advisor for EPA and the US State Department on the US position in the global treaty on mercury emissions between 2020 and 2022 (Minamata Convention) and the steering committee for EPA's National Forum on Contaminants in Fish in 2022-

[4] D.P. Krabbenhoft, E.M. Sunderland. 2013. Global change and mercury. *Science.* 341 (6153), 1457-1458.
[5] A.T. Schartup, C.P. Thackray, A. Qureshi, C. Dassuncao, K. Gillespie, A. Hanke, E.M. Sunderland. 2019. Climate change and overfishing increase neurotoxicant in marine predators. *Nature*. 572 (7771): 648-650.
[6] Y. Zhang, D.J. Jacob, H.M. Horowitz, L. Chen, H.M. Amos, D.P. Krabbenhoft, F. Slemr, M.S. Landis, V. St. Louis, E.M. Sunderland. 2016. Observed decrease in atmospheric mercury explained by global decline in anthropogenic emissions. *Proceedings of the National Academy of Sciences of the United States of America.* 113(3), 526-531.
[7] E.M. Sunderland, C.T. Driscoll, Jr., J.K. Hammitt, P. Grandjean, J.S. Evans, J.D. Blum, C.Y. Chen, D.C. Evers, D.A. Jaffe, R.P. Mason, S. Goho, W. Jacobs. 2016. Benefits of regulating hazardous air pollutants from coal and oil-fired utilities in the United States. *Environmental Science & Technology.* 50, 2117-2120.
[8] E.M. Sunderland, C.P. Thackray, B. Geyman, M. Dai, J. Hammitt, S. Goho, C. Driscoll. 2022. A Template for a State-of-the-Science Assessment of the Public Health Benefits associated with Mercury Emissions Reductions for Coal-fired Electricity Generating Units. Harvard Chan C-CHANGE White Paper. Available: https://www.hsph.harvard.edu/c-change/news/mercury-emission.s-reductions/
[9] M.Q. Dai, B.M. Geyman, X.C. Hu, C.P. Thackray, E.M. Sunderland. 2023. Sociodemographic disparities in mercury exposure from U.S. coal-fired power plants. *Environmental Science & Technology Letters*. 10(7): 589-595.

2023. I am the Editor-in-Chief for the Royal Society of Chemistry Journal: Environmental Science: Processes and Impacts and I serve on the advisory boards of several other journals. In general, I have served as a peer-reviewer and advisor on issues related to environmental mercury contamination and associated health risks for over 20 years.

11. A copy of my complete profile can be found here: https://sunderlandlab.org/assets/emscv_web_0124.pdf and is attached as Exhibit A.

III. Large Societal Costs of Mercury Pollution

12. EPA's inability to fully monetize the public health benefits associated with reducing mercury and non-mercury HAP pollution reflects the limited availability of models for conducting cross-media (air-water-fish-human exposure) analyses at this time and challenges with assigning monetary values to effects other than premature mortality. Large public health benefits from reducing exposure to fine particulate matter are well established because exposures occur directly following emissions through inhalation and can easily be related to premature mortality, which is assigned a standard monetary value by the Office of Management and Budget.[10] For pollutants like mercury and some other HAP,

[10] *See, e.g.,* C.T. Driscoll, J.J. Buonocore, J.I. Levy, K.F. Lambert, D. Burtraw, S.B. Reid, H. Fakhraei, J. Schwartz. (2015) U.S. power plant carbon standards and clean air and health co-benefits. Nature Climate Change. 5, 535-540.

major health endpoints are diverse and include more than premature mortality. To quantify public health benefits of emissions reductions, models linking atmospheric processes, food web accumulation, human dietary preferences, and exposure-response relationships for U.S. individuals are needed. This poses a substantial challenge for regulators tasked with quantifying impacts and benefits, especially given budget cuts for these Federal Agencies.

13. EPA's inability to fully monetize the direct societal costs of mercury pollution have led to incorrect assertions that health damages associated with exposure are small.[11] Exposure of pregnant women and children to mercury through fish and shellfish consumption is associated with long-term developmental deficits that persist throughout life.[12] Exposure of adults to mercury has been associated with risk of premature mortality due to cardiovascular disease,[13] which is the leading cause of death in the United States. Total societal costs of mercury exposure can be estimated from the monetization methods EPA used in its reaffirmation that it is appropriate and necessary to regulate EGUs under CAA

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[11] Aldy, J., et al. (2020). "Deep flaws in a mercury regulatory analysis." Science 368 (6488): 247-248.

[12] Debes, F., et al. (2016). "Cognitive deficits at age 22 years associated with prenatal exposure to methylmercury." Cortex 74: 358-369.

[13] Genchi, G., et al. (2017). "Mercury Exposure and Heart Diseases." International Journal of Environmental Research and Public Health **14**(1). Hu, X. F., et al. (2021). "Mercury exposure, cardiovascular disease, and mortality: A systematic review and dose-response meta-analysis." Environmental Research **193**.

section 112, finalized in 2023,[14] as well as measured mercury concentrations in the blood of a statistically representative survey of U.S. individuals (National Health and Nutrition Examination Survey: NHANES).[15] Easily monetizable health damages to the U.S. population include impacts on intelligence quotient (IQ) and premature mortality due to cardiovascular disease (CVD). These data show that on average between 2011- 2018, the total societal costs of mercury exposure in the United States were between $50-70 Billion USD per year, depending on the discount rate that is used.

14. My research[16] has estimated that the direct public health benefits of reducing mercury exposures from U.S. EGUs following implementation of MATS, 77 Fed. Reg. 9304, ranged between $1.2-1.5 billion per year USD, and were comparable to the costs associated with that rule, even before considering non-mercury HAP and other co-benefits from traditional air pollutants. Further, many benefits were unquantified, meaning our estimates represent a lower bound.

15. For example, it is a challenging research task for economists to estimate how lifetime earnings are affected by the full suite of neurocognitive

[14] 88 Fed. Reg. 24854.
[15] Centers for Disease Control and Prevention (CDC) (2023). "National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Analytical Guidelines. Department of Health and Human Services, Centers for Disease Control and Prevention, Hyattsville, MD, U.S., http:/www.cdc.gov/nchs/ nhanes/nhanes2003-2004/analytical_guidelines.htm (accessed 01 11 23).
[16] Sunderland et al., supra n.8.

effects known to be associated with mercury exposure. These include impaired memory, delayed learning, and behavioral impacts. For similar reasons, prior work has not monetized the effects of mercury exposure on the endocrine system, and deleterious impacts on ecosystems and wildlife across the United States. Among all environmental contaminants, the vast majority (>70%) of recreational fish consumption advisories across the country were for mercury based on the last data collected by the National Listing of Fish and Wildlife Advisories Program.[17] The dangers of mercury exposure for sensitive bird and amphibian populations across the United States are well established, but this has also not been directly monetized at the national scale so has not been included in regulatory benefits assessments. However, such benefits are likely to be large. For example, a settlement for local damages to fish and wildlife caused by mercury contamination from a single chlor-alkali facility on an 80-mile stretch of the South River in Virginia was over $50 million.[18]

16. For the monetized benefits we estimated in our work, we used state-of-the-science atmospheric models to link EGU emissions to deposition as US

[17] US EPA (2013). 2011 National Listing of Fish Advisories (NLFA). Available at: https://archive.epa.gov/epa/sites/production/files/2015-06/documents/technical-factsheet-2011.pdf. Last Accessed: August 23, 2023. Washington, DC, U.S. Environmental Protection Agency. EPA-820-F-13-058: 9.

[18] Virginia Secretary of Natural and Historic Resources, DuPont NRDAR Settlement, https://www.naturalresources.virginia.gov/initiatives/dupont-nrdar-settlement.

ecosystems,[19] as well as data on individual dietary preferences for U.S. consumers,[20] and mercury levels measured in the blood of a statistically representative cross-sectional sample of the population.[21] We calculated the net benefits of declines in mercury emissions from U.S. coal-fired EGUs before (ca. 2010) and after the MATS rule was fully implemented (ca. 2020). We also assessed whether any exposures above the U.S. EPA reference dose (RfD) for methylmercury attributable to U.S. coal-fired EGUs remained after implementation of MATS, and whether there were sociodemographic disparities in exposures to mercury from EGUs, as well as in proximity to facility retirements.

17. Our work showed that direct public health benefits from lowered mercury exposures resulting from EGU emissions reductions that occurred after implementation of MATS were greater than $1.2 billion USD per year. The share of the U.S. population exposed to mercury at levels above those associated with increased risk of ischemic heart disease decreased by 380,000 individuals, and the share exposed at levels above those associated with increased risk of

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[19] Shah, V.; Jacob, D.J.; Thackray, C.P.; Wang, X.; Sunderland, E.M.; Dibble, T.; Saiz-Lopez, A.; Cernusak, I.; Kello, V.; Castro, P.; Wu, R.; Rongrong, W.; Wang, C. 2021. Improved mechanistic model of the atmospheric redox chemistry of mercury. Environmental Science & Technology. https://doi.org/10.1021/acs.est.1c03160.
[20] Sunderland, E. M.; Li, M.; Bullard, K. 2018. Decadal Changes in the Edible Supply of Seafood and Methylmercury Exposure in the United States. Environmental Health Perspective. doi: 10.1289/EHP2644.
[21] NHANES, 2009-2018. Center for Disease Control. National Health and Nutrition Examination Survey. https://wwwn.cdc.gov/nchs/nhanes/. Last Accessed March 15, 2022.

cardiovascular mortality decreased by 160,000 individuals. Further, mercury emissions reductions following MATS allowed 60,000-100,000 women of childbearing age (16-49) to shift from above to below the EPA's Reference Dose (RfD) for methylmercury and yielded 3700-5600 fewer babies born per year with exposures above the RfD. Further, we noted that despite large mercury deposition declines, an end-member scenario for remaining exposures from the largest EGUs for individuals consuming self-caught fish suggests they could still exceed the U.S. EPA RfD dose for methylmercury. Prior to *MATS*, populations living within 5-km of active EGUs (*n*=507 facilities) included greater proportions of frequent fish consumers, individuals with low annual income and less than high school education, and limited English-proficiency households. These results reinforce a lack of distributional justice in plant siting found in prior work. Significantly greater proportions of low-income individuals lived within 5-km of active facilities in 2020 (*n*=277) compared to those that retired after 2010, suggesting that socioeconomic status may have played a role in retirement.

18. One can infer from the extent of quantified and qualitative benefits of reducing mercury and non-mercury HAP that the direct public health benefits from controlling HAP emissions from U.S. EGUs exceed costs. Thus, I strongly assert that EPA's limited data on direct monetary benefits associated with HAP

reductions are inconsistent with the actual large societal benefits associated with emission reductions.

IV. Utility-Attributable Mercury Pollution Adds to Large Background Exposures and Pushes Individuals Above the EPA Reference Dose (RfD)

19. General human exposures to mercury through seafood consumption are very close to established toxicological thresholds because humans have increased the global atmospheric reservoir of mercury by seven-fold, with the same magnitude of increases in atmospheric mercury deposition to global ecosystems.[22] While domestic emissions can be controlled and reduced by Federal regulations, global sources of mercury from emissions in other countries and re-emissions of historical mercury pollution cannot be reduced domestic actions. As a result, even small amounts of utility-attributable mercury from domestic EGUs can push individuals above levels associated with adverse health impacts. This is highlighted by the large number of U.S. women of childbearing age (60,000-100,000) who were pushed below the EPA RfD by mercury emissions reductions associated with the initial MATS controls.[23] Despite these changes, the most recent blood mercury

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[22] B.M. Geyman, C.P. Thackray, D.J. Jacob, E.M. Sunderland. 2023. New satellite data for SO_2 suggests higher volcanic mercury emissions concentrated in the Northern Hemisphere. *Geophysical Research Letters.* 50 (21), e2023GL104667.
[23] Sunderland et al., supra n.8.

data for the U.S. population (NHANES 2011-2018) suggest that between 150,000 to 360,000 babies are born annually with mercury exposures above the EPA RfD, placing them at elevated risk of neurocognitive impairment. Further, 7.4 million adults exceed thresholds associated with elevated risks of cardiovascular disease.

20. While MATS has effectively reduced mercury exposures from U.S. coal-fired EGUs across the country, our recent analysis suggests two deposition hotspots remain in communities surrounding lignite-fired EGUs in North Dakota and Texas.[24] We estimated using U.S. Census Data[25] that over 1500 high-frequency fish consumers resided within 15 km of the highest emitting lignite-fired EGUs in 2020. High-frequency fish consumers are individuals who are especially vulnerable to mercury exposure because of their dietary preferences and who have significantly higher blood mercury concentrations in the NHANES surveys.[26] The category of high-frequency fish consumers includes individuals who self-identify in the U.S. Census as Asian, Pacific and Caribbean Islander, Native American, Alaska Native, Multi-racial and Unknown Race.

V. Residual Risks Affected by Lignite-Fired EGUs that Exceed the U.S. EPA Reference Dose Would be Reduced

[24] Dai et al., supra n.9.
[25] United States Census Bureau (US Census). American Community Survey. 2016-2020 American Community Survey 5-Year Estimates. Published 2022. Accessed June 21, 2023. https://data.census.gov/
[26] CDC, supra n.18.

21. Our analysis of mercury exposure risks from lignite fired EGU emissions included an examination of atmospheric mercury deposition in 2020, consumption patterns of U.S. fishers who live adjacent to these facilities and are most highly exposed,[27] and measured mercury concentrations in fish in ecosystems surrounding the highest emitting plants in Texas and North Dakota, where public health risks are most severe.[28] Emissions from these facilities in 2020 were sufficient to push some high-frequency fish consumers living adjacent to the plants above the EPA RfD for methylmercury. The RfD for methylmercury is outdated and is therefore likely an overestimate of methylmercury exposures that pose appreciable risks. EGU-attributable mercury and non-mercury HAP exposure adds to already substantial background risks from other domestic and international sources. Realized risks to public health reflect this cumulative rather than source-specific exposure. It is therefore imperative that controls on domestic emissions are maximized, given substantial deposition of mercury in the U.S. from international sources and the potential for future increases.[29]

22. The RfD is a regulatory threshold established more than 20 years ago based on IQ deficits in children from chronic methylmercury exposure at levels

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[27] von Stackelberg, K., et al. (2017). "Results of a national survey of high-frequency fish consumers in the United States." Environmental Research **158**: 126-136.
[28] Dai et al., supra n.9.
[29] B.M. Geyman, D.G. Streets, C.P. Thackray, C.L. Olson, K. Schaefer, E.M. Sunderland. 2024. Projecting global mercury emissions and deposition under the shared socioeconomic pathways. Earth's Future. 12(4): e2023EF004231.

expected from fish consumption. It is meant to define the lifetime exposure level without an appreciable increase in health risks. Subsequent scientific literature has noted that the RfD is much higher than would be concluded based on more recent epidemiological analyses.[30] As a result, a review of EPAs integrated risk information system (IRIS) assessment for methylmercury is ongoing.[31]

VI. Environmental Justice Concerns Associated with Lignite-Fired EGUs

23. Sociodemographic disparities in exposure and health effects from traditional air pollutants in communities surrounding domestic EGUs are well established.[32] The greatest numbers of EGUs are in neighborhoods with high proportions of people of color and foreign-born residents, and those that historically were designated as the highest perceived investment risks ("red-lined").[33]

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[30] Grandjean, P.; Budtz-Jorgensen, E. An ignored risk factor in toxicology: The total imprecision of exposure assessment. Pure Appl. Chem. 2010, 82 (2), 383−391

[31] https://www.federalregister.gov/documents/2020/05/28/2020-11467/availability-of-the-systematic-review-protocol-for-the-methylmercury-integrated-risk-information

[32] Spiller, E., et al. (2022). "Mortality Risk from PM2.5: A Comparison of Modeling Approaches to Identify Disparities across Racial/Ethnic Groups in Policy Outcomes (vol 129, 127004, 2021)." Environmental Health Perspectives **130**(1).

[33] Cushing, L. J., et al. (2022). "Historical red-lining is associated with fossil fuel power plant siting and present-day inequalities in air pollution emissions." Nature Energy https//doi.org/10.1038/s41560-022-01162-y.

24. Disadvantaged communities that include households with lower income and limited English-speaking proficiency often exhibit greater vulnerability to air pollution exposures compared to the general population.[34]

25. Within 5 km of active U.S. EGUs in 2010 and 2020, my group's research found a statistically higher incidence of individuals with low income and poverty, less than high-school education, and limited-English proficiency households compared to the U.S. general population. [35] A greater proportion of low-income individuals were in communities within 5 to 15 km of active plants in 2020 than those within 5 to 15 km of plants that retired between 2010 and 2020, suggesting socioeconomic status may have played a role in plant retirements. It is therefore plausible that decisions about EGU retirement may have been influenced by the relative wealth of communities surrounding plants.

26. In communities within 15 km of the highest emitting lignite-fired EGUs in North Dakota and Texas in 2020, we estimate there are more than 13,000 individuals within 200% of the Federal Poverty Line, greater than 6500 individuals with income <$20,000 per year, more than 5000 residents with less than a high-school education and more than 600 households with limited English-speaking

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[34] *See, e.g.,* Penn, S. L., et al. (2017). "Estimating State-Specific Contributions to PM2.5- and O-3-Related Health Burden from Residential Combustion and Electricity Generating Unit Emissions in the United States." Environmental Health Perspectives **125**(3): 324-332.
[35] Dai et al., supra n.9.

capability, which contributes to marginalization.[36] These communities are especially vulnerable to the adverse impacts of HAP and fine particulate matter (fPM) exposures and would benefit from the immediate implementation of strengthened standards proposed by the Final Rule. This vulnerable demographic includes more than 27,000 individuals within 15-km of these plants.

VII. Conclusion

27. In summary, mercury exposures from lignite-fired EGUs in Texas and North Dakota are still sufficient to push individuals above EPA's RfD for methylmercury (which is outdated and therefore likely underestimates harm). Exposures to mercury, non-mercury HAP, and fPM from these plants pose immediate health risks that include neurodevelopmental deficits for children, risk of premature mortality from both mercury and fPM, and increased risk of cancer from exposure to non-mercury HAP. Immediate health benefits for marginalized communities and high-frequency fish consumers surrounding these plants from reductions in mercury, non-mercury HAP, and fPM exposure are likely to be substantial. Immediate implementation of the Final Rule would address the largest

[36] United States Census Bureau (US Census). American Community Survey. 2016-2020 American Community Survey 5-Year Estimates. Published 2022. Accessed June 21, 2023. https://data.census.gov/

two remaining domestic mercury deposition hotpots from coal-fired EGUs and associated adverse health effects for more than 27,000 vulnerable individuals.

I declare under the penalty of perjury under the laws of the United States, that to the best of my knowledge, the foregoing is true and correct.

Executed on July 19, 2024, at Cambridge, Massachusetts

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Elsie M. Sunderland

ATTACHMENT 1

ELSIE M. SUNDERLAND

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Ph: +1-617-496-0858; Email: ems@seas.harvard.edu ORCID: http://orcid.org/0000-0003-0386-9548

ACADEMIC APPOINTMENTS & PROFESSIONAL EXPERIENCE

Harvard University, Cambridge MA, USA

2022-present	Fred Kavli Professor of Environmental Chemistry and Professor of Earth and Planetary Sciences, Harvard University
2018-present	Professor of Environmental Science and Engineering, Department of Environmental Health, Harvard T.H. Chan School of Public Health (HSPH)
2021-2022	Professor of Earth and Planetary Sciences, Harvard Faculty of Arts and Sciences
2018-2022	Gordon McKay Professor of Environmental Chemistry, Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS)
2018-2021	Faculty Affiliate, Department of Earth and Planetary Sciences, Harvard University
2015-2018	Thomas D. Cabot Associate Professor of Environmental Science and Engineering, SEAS
2014-2018	Associate Professor of Environmental Science and Engineering, Department of Environmental Health, HSPH
2014-2015	Associate Professor of Environmental Science and Engineering, SEAS
2010-2014	Mark and Catherine Winkler Assistant Professor of Aquatic Science, HSPH
2008-2010	Research Associate, SEAS & Harvard Center for Risk Analysis, HSPH

U.S. Environmental Protection Agency, Washington DC, USA

2004-2008 Worked in the Office of Science Policy; Office of the Science Advisor; National Center for Environmental Research; National Center for Environmental Economics; National Exposure Research Laboratory. *Positions and responsibilities included*:

- Led cross-Agency workgroup drafting guidance on the development, evaluation and application of environmental models used to inform regulatory decisions.
- Developed policy recommendations for nearshore water quality in the Great Lakes as the representative for the International Air Quality Planning Board (IAQAB) of the International Joint Commission (IJC).
- Developed federal regulations for atmospheric emissions of hazardous air pollutants from coal-fired utilities.

Lunenburg Municipal Government, Bridgewater NS, Canada

1994-1995 Assisted in the development of the first fully integrated four waste stream management system in North America (large-scale recycling and composting).

EDUCATION

1997	B.Sc., Environmental Science, McGill University, Canada
2003	Ph.D., Environmental Toxicology, Simon Fraser University, Canada
2003-2004	Postdoctoral Fellow, Office of Science Policy, US Environmental Protection Agency

PERSONAL

Citizenship: dual, Canada and United States.

ACADEMIC & PROFESSIONAL HONORS

2019-2023	Web of Science Highly Cited Researcher (multiple highly cited papers in top 1% of field)
2017	Harvard Star Family Award for Promising Scientific Research
2013	Excellence in Reviewing Award from journal *Biogeochemistry*
2012	Smith Family Foundation Award for Excellence in Biomedical Research
2010	U.S. EPA Level II Scientific & Technological Achievement (STAA) Award
2010	Outstanding Reviewer citation by Editorial Board of *Estuaries and Coasts*
2008	U.S. EPA Level I (highest level) Scientific & Technological Achievement (STAA) Award
2005	U.S. EPA National Honor Award, Gold Medal for Exceptional Service
2003	Dean's Convocation Medal (best graduate thesis), Simon Fraser University
2002	Society of Environmental Toxicology & Chemistry best student paper presentation
1998-2002	Natural Sciences and Engineering Research Council of Canada Graduate Fellowships
1993	Greville Smith Scholarship (top-entrance scholarship), McGill University
1993	Canada Scholarship, Industry and Technology Canada

RECENT PROFESSIONAL SERVICE

Editorial

2024-present	Editor in Chief, *Environmental Science: Processes and Impacts*
2021-present	Editorial Advisory Board, *ACS Environmental Au*
2018-present	Editorial Advisory Board, *Environmental Science & Technology*
2017-2023	Editorial Advisory Board, *Environmental Science: Processes and Impacts*
2022-2023	Guest Editor, Special Issue: Per- and polyfluoroalkyl substances, *Current Opinion in Green and Sustainable Chemistry* (with Ralf Ebinghaus and Lutz Ahrens)
2021-2022	Guest Editor, Special Issue: Biogeochemistry of Trace Elements, *Environmental Science: Process & Impacts* (with Lenny Winkel, ETH)
2018-2022	Editorial Board Member, *International Journal of Environmental Research and Public Health (IJERPH)*
2021	Guest Editor, *Environmental Science: Processes and Impacts* on Biogeochemistry of Trace Elements
2020	Guest Editor, *iScience* on PFAS contamination and remediation
2018	Guest Editor, *ACS Earth and Space Science*, 2018, Special Issue on Global Mercury Cycling

International

2022-	Advisory Board, Back to Blue Initiative on Ocean Pollution, Economist Impact Group and Nippon Foundation
2020-2021	Theme co-chair, GeoHealth, Goldschmidt 2021, virtual meeting, 4-9 July, 2021.
2019	Scientific Observer/Expert for the *ad hoc* committee on Effectiveness Evaluation for the Minamata Convention on Mercury, UNEP.
2018-2019	Planning Committee and Exposure Workgroup Co-Chair, SETAC Special Topic Meeting on PFAS Risk Assessment, Durham, NC, August 12-15, 2019.
2017-2019	Scientific Steering Committee, 14th International Conference on Mercury as a Global Pollutant, Krakow, Poland, 2019.
2017-2018	Contributor, 2018 UNEP Global Mercury Assessment (atmospheric and biotic workgroups).

National

2022-23	Steering Committee, National Forum on Contaminants in Fish organized by the US Environmental Protection Agency.
2020-2022	Expert advisor for U.S. State Department and US EPA delegation for the Minamata Convention.
2021	Expert consultant for the Fond du Lac Tribe, MN on environmental pollution issues August 2021.
2020	U.S. National Academies planning committee and session chair for Federal Government Human Health PFAS Research Workshop, October 26-27, 2020.
2019	U.S. National Academies of Science, Engineering and Medicine: Workshop Planning Committee on Perfluoroalkyl and Polyfluoroalkyl Substances in the Environment - A Systems Approach to Exploring Exposure and Identifying Opportunities for Leadership, September 26-27, 2019.

University Service: Harvard

2024-	Chair, SEAS working group on Climate/Sustainability/Energy
2024-	Member, SEAS Professional Programs Working Group
2023-	Member, Aramont Fund Review Committee, Vice-Provost for Research Office
2023-	Board of Tutors, Concentration in Environmental Science and Public Policy
2023-	Member, Climate cluster hire search committee, SEAS
2023-	Area Chair, Graduate Admissions Committee, SEAS
2022	Harvard Committee on Climate Education
2021-22	Harvard Provost's Academic Leadership Forum
2020-22	Director of Undergraduate Studies, Environmental Science and Engineering, SEAS
2020-22	Undergraduate Engineering Committee, SEAS
2019-22	Harvard Standing Committee on Oceanography
2019-22	Honors Committee, Environmental Science and Public Policy Board of Tutors
2016-22	Standing Committee on the Concentration in Environmental Science and Public Policy
2018-22	Harvard Standing Committee on Women
2019-22	Presidential Committee on Sustainability, Member
2019-22	Harvard Faculty Council, Division Representative for Natural and Applied Sciences
2020-22	Mentoring Committee, Department of Earth and Planetary Sciences
2020-21	Review Committee, Harvard Hoopes Prize for Natural Sciences Undergraduate Research
2020-21	Harvard Faculty of Arts and Sciences financial study working group
2017-20	Director of Graduate Studies, Environmental Science and Engineering, SEAS
2019-20	Docket Committee, Harvard Faculty of Arts and Sciences
2018-20	Member, Faculty search committee in Risk Assessment, HSPH
2018-19	Member, Faculty search committee in Marine Biology, Organismic and Evolutionary Biology (OEB)
2018-19	Member, Faculty search committee in Earth History, Earth and Planetary Sciences (EPS)
2018	Harvard Campus Sustainability Innovation Fund (CSIF) Review Committee
2017-18	Harvard University child-care vendor selection committee
2017-18	Harvard Food Sustainability Standards Committee
2017-18	Member, Faculty search committee in Climate Science (EPS/SEAS)
2016-18	Harvard Alumni Association Speakers Bureau
2016-17	Harvard University Climate Change Task Force
2016-17	Harvard Office of Sustainability Healthy Buildings Initiative

RESEARCH MENTORING

Doctoral Students:

[17] Olivia Pietz (PhD 2023-; G1); [16] Evan Routhier (PhD 2022-; G2); [15] Jahred Liddie (Sc.D. 2021-, G4); [14] Mona Dai (2020-; G5); [13] Heidi Pickard (2020-; G5); [12] Jennifer Sun (2019-; G6); [11] Ben Geyman (2019-; G6); [10] Bridger Ruyle (2018-2022, now postdoc Carnegie Inst.); [9] Rebecca Stern (PhD 2016-2021, now postdoc HSPH); [8] Charlotte Wagner (PhD 2015-2021, now scientist Stockholm Env. Inst.); [7] Andrea (Weber) Tokranov (PhD 2013-2019, now hydrologist USGS); [6] Xindi Hu (Sc.D. 2014-2018, now lead data scientist Mathematica); [5] Clifton Dassuncao (Sc.D. 2013-2018, now Vice President ERG); [4] Ryan Calder (Sc.D. 2012-2017, now Asst. Prof. Virginia Tech.); [3] Hannah Horowitz (PhD 2011-2017, now Asst. Prof. U. Illinois); [2] Miling Li (Sc.D. 2011-2016, now Asst. Prof., U. Del.); [1] Helen Amos (PhD 2010-2014, now senior scientist NASA).

Master's Students:

[5] Adela Chovancova (2017-18, now Regulatory and Compliance Manager at Catania Oils); [4] Paheliya Aixilafu (2016-17, now Doctoral candidate, U. Michigan); [3] Amelia Valberg (2014-15, now Senior Consultant, Rambold); [2] Matthew Tumpney (2011-12, now Epidemiologist, MA DEP); [1] Elizabeth Corbitt (2010-15, now science teacher Louisiana).

Undergraduate Research Assistants, Thesis and/or Independent Study Students

[28] Jack Bruce (2022-present), [27] Sharmila Day (2022-present), [26] Sophia Ludtke (2022-present), [25] Julia Mansfield (2022-present), [24] Sarah Beckwith (2021-22) [23] Evan Hunsicker (2021-22), [22] Jordan Daigle (2021), [21] Elida Kocharian (2020), [20] Maya Levine (2020-22), [19] Jonas LaPier (2019-21), [18] Jenn Greiner (2020-21), [17] Cecil Myers (2019-20), [16] Daniel Chang (2019-20), [15] Beverly Ge (2017-19), [14] Chandler Brown (2018-19), [13] Nicole Nishizawa (2017-19), [12] Helen Kim (2018), [11] Amira Hannon (2018), [10] Bruno Moguel Gallegos (2017-18), [9] Alina McIntyre (2017), [8] Nakoa Farrant (2017-18), [7] Alicia Juang (2016-18), [6] Jessica Ewald (2015-17), [5] Harry Stone (2015-16), [4] Jahred Liddie (2014-16), [3] Sam Krabbenhoft (2015), [2] Angela Jiang (2014), [1] Kurt Bullard (2014).

Postdoctoral Fellows/Research Associates:

[17] Yumin Zhu (2023-present); [16] Connor Olson (2023-present); [15] Fabian Fischer (2022-2023, now Asst. Prof. URI); [13] Scott Zolkos (2020-2022, now Scientist at Woodwell Climate Research Center); [12] Lara Schultes (2019-2021, now Environmental Consultant, Stockholm, Sweden); [11] Colin Thackray (2016-2021, now Research Scientist, Sunderland Lab); [10] Maxime Enrico (2019-2021, now Postdoctoral Fellow, Université de Pau, France); [9] Kyle Delwiche (2018-2019, now Res. Scientist, UC Berkeley); [8] Marie Perkins (2017-2019, now Asst. Prof. UW Stevens Point); [7] Linjun Yao (2017-2019, now Scientist, MA DEP); [6] Amina Schartup (2012-2017, now Assoc. Prof., Scripps Institute of Oceanography); [5] Xianming Zhang (2013-2016, now Asst. Prof., Concordia U.); [4] Yanxu Zhang (2013-2015, now Professor, Nanjing U.); [3] Anne Soerensen (2011-2014, now Curator, Swedish Museum of Natural History); [2] Asif Qureshi (2011-2013, now Associate Professor, IIT Hyderabad, India); [1] Jenny Fisher (2011-2012; now Senior Lecturer, U. of Wollongong, Australia).

Doctoral Examination Committees - External Universities

[9] Frits Steenhuisen, University of Groningen (Examining Committee, 2023); [8] Connor Olsen, Syracuse University (Committee Member, 2021-2023); [7] Aryeh Feinberg, ETH, Switzerland (Examining Committee, 2020); [6] Lara Schultes, Stockholm University, Sweden (Opponent, 2019); [5] Amanda Giang, MIT, Institute for Data, Systems and Society (Committee Member, 2013-2017); [4] Michelle Mastromonaco, Chalmers University of Technology, Sweden (Opponent, 2016); [3] Matthew Binnington, University of Toronto, Canada (External Examiner, 2016); [2] Ravinder Pannu, University of Saskatchewan, Canada (External Examiner, 2012); [1] Adrienne Ethier, University of Ottawa, Canada (External Examiner, 2009).

TEACHING

Active:

EPS/ESE-161 Undergraduate Course, Applied Environmental Toxicology, Harvard School of Engineering and Applied Sciences, Spring 2015; Fall 2016; Fall 2019; Spring 2022, Spring 2024.

EPS/ESE-169 Undergraduate Course, Seminar on Global Pollution Issues, Harvard School of Engineering and Applied Sciences, Spring 2013; Fall 2017; Spring 2021; Fall 2023.

Past:

EPS/ESE-6 Undergraduate Course, Introduction to Environmental Science and Engineering, Harvard School of Engineering and Applied Sciences, Spring 2016-2018; 2020-2021.

ES-298r Graduate Course: Mitigating Toxicity Through Materials Design, Harvard School of Engineering and Applied Sciences, Fall 2015.

RDS-500 Graduate Course: Risk Assessment, Department of Environmental Health, Harvard School of Public Health, Spring 2011-2014.

ENVR E-215 Graduate Course: Environmental Science, Harvard Extension School, Fall 2011.

Other teaching activities:

2009-2023 Faculty, Analyzing Risk: Science, Assessment, and Management; Center for Continuing Professional Education, Harvard School of Public Health. (~60 students each year).

2008 Developed curriculum and instructed training course on the use of models in environmental regulatory decision-making for U.S. EPA Region 1. (~50 staff members).

2004-2008 Led nation-wide seminar series (webinar) for ten U.S. EPA Regional Offices on the use of environmental models to inform environmental management decisions.

PUBLICATIONS

*Students and postdocs mentored are underlined. Senior author indicated by the last position. *Denotes undergraduates.*

PEER-REVIEWED JOURNALS

2024

125. P. Shende, L. Zifeng, **E.M. Sunderland**, A. Qureshi. 2024. Potential reductions in fine particulate matter and premature mortality following implementation of air pollution controls on coal-fired power plants in India. *Air Quality, Atmosphere & Health.* Accepted.

124. F. Fischer, *S. Ludtke, C.P. Thackray, H. Pickard, F. Haque, C. Dassuncao, S. Endo, L. Schaider, **E.M. Sunderland.** 2024. Binding of per- and polyfluoroalkyl substances (PFAS) to serum proteins: Implications for toxicokinetics in humans. https://doi.org/10.1021/acs.est.3c07415.

123. M. Dunn, N. Noons, S. Vojta, J. Becanova, H. Pickard, **E. Sunderland**, R. Lohmann. 2024. Unregulated active and closed textile mills represent a significant vector of PFAS contamination into coastal rivers. *ES&T Water*. https://doi.org/10.1021/acsestwater.3c00439.

122. C. Richon, C. Wagner, **E.M. Sunderland**, A. Tagliabue. 2024. A global biogeography analysis reveals vulnerability of surface marine zooplankton to anthropogenic stressors. *One Earth*. 7, 1-15.

2023

121. B.J. Ruyle, H.M. Pickard, L. Schultes, F. Fredriksson, A.L. Heffernan, D.R.U. Knappe, H.L. Lord, P. Meng, M.A. Mills, K. Ndung'u, P. Roesch, J. Van Buren, C. Vogel, D.C. Westerman, L.W.Y. Yeung, **E.M. Sunderland**. 2023. An interlaboratory comparison of extractable organofluorine measurements in groundwater and eel (*Anguilla rostrata*): Recommendations for methods standardization. *Environmental Science & Technology.* 57(48): 20159-20168.

120. B.M. Geyman, C.P. Thackray, D.J. Jacob, **E.M. Sunderland**. 2023. New satellite data for SO_2 suggests higher volcanic mercury emissions concentrated in the Northern Hemisphere. *Geophysical Research Letters.* 50 (21), e2023GL104667.

119. M.Q. Dai, B.M. Geyman, X.C. Hu, C.P. Thackray, **E.M. Sunderland**. 2023. Sociodemographic disparities in mercury exposure from U.S. coal-fired power plants. *Environmental Science & Technology Letters*. 10(7): 589-595.

118. B.J. Ruyle, C.P. Thackray, C. Butt, D. LeBlanc, A.K. Tokranov, C.D. Vecitis, **E.M. Sunderland**. 2023. Centurial persistence of forever chemicals at military fire training sites. *Environmental Science & Technology*. 57(21), 8096-8106.

117. J. Liddie, L. Schaider, **E.M. Sunderland**. 2023. Sociodemographic factors are associated with the abundance of PFAS sources and detection in U.S. community water systems. *Environmental Science & Technology*. 57(21), 7902-7912.

116. B.J. Ruyle, L. Schultes, D.M. Akob, C.R. Harris, M.M. Lorah, S. Vojta, J. Becanova, S. McCann, H.M. Pickard, A. Pearson, R. Lohmann, C.D. Vecitis, **E.M. Sunderland**. 2023. Nitrifying bacteria linked to biotransformation of perfluoroalkyl sulfonamido precursors from legacy aqueous film forming foams. *Environmental Science & Technology*. 56(22): 15573-15583.

115. X.C. Hu, M. Dai, J.M. Sun, **E.M. Sunderland**. 2023. The utility of machine learning models for predicting chemical contaminants in drinking water: Promise, challenges, and opportunities. *Current Environmental Health Reports*. 29(2): 131-147.

2022

114. A.S. Young, H.M. Pickard, **E.M. Sunderland**, J.G. Allen. Organic fluorine as an indicator of per- and polyfluoroalkyl substances in dust from buildings with healthier versus conventional materials. *Environmental Science & Technology*. 56(23): 17090-17099.

113. H.M. Pickard, B.J. Ruyle, C. Dassuncao, A. Chovancovaa, C.P. Thackray, J. Becanova, S. Vojta, R. Lohmann, **E.M. Sunderland**. 2022. Bioaccumulation of PFAS and precursors in freshwater recreational fish and implications for fish advisories. *Environmental Science & Technology*. 56(22): 15573-15583.

112. K.B. Delwiche, J.A. Harrison, J.D. Maasakkers, M.P. Sulprizio, J. Worden, D.J. Jacob, **E.M. Sunderland**. 2022. Estimating drivers and pathways for hydroelectric reservoir methane emissions using a new process-based model. *Journal of Geophysical Research - Biogeosciences*. 127 (8), e2022JG006908.

111. L. Muñoz-Abri, C.A. Valle, J.J. Alava, S.E. Janssen, **E.M. Sunderland**, F. Rubianes-Landázuri, S.D. Emslie. 2022. Elevated mercury concentrations and isotope signatures (C, N, Hg) in yellowfin tuna (*Thunnus albacares*) from the Galápagos Marine Reserve and waters off Ecuador. *Environmental Toxicology and Chemistry.* 41 (11), 2732-2744.

110. G.A. de Vera, B.Y. Brown, S. Cortesa, M. Dai, J. Bruno, J. LaPier, N. Sule, M. Hancock, B. Yoon, A. Chalah, **E.M. Sunderland**, S.C. Wofsy. 2022. HazeL: A low-cost learning platform for aerosol measurements. *Journal of Chemical Education.* 99(9): 3203-3210.

109. C.I. Olson, B.M. Geyman, C.P. Thackray, D.P. Krabbenhoft, M.T. Tate, **E.M. Sunderland**, C.T. Driscoll. 2022. Mercury in soils of the conterminous United States: Patterns and pools. *Environmental Research Letters*. 17(7), 074030.

108. J.M. Sun, B.C. Kelly, F.A.P.C. Gobas, **E.M. Sunderland.** 2022. A food web bioaccumulation model for the accumulation of poly- and perfluoroalkyl substances (PFAS) in fish: How important is renal elimination? *Environmental Science: Processes & Impacts*. 24(8), 1152-1164

107. C.D. Golden, J. Ayroles, J.G. Eurich, J.A. Gephart, K.L. Seto, M.K. Sharp, P. Balcom, H.M. Barravecchia, K.K. Bell, K.D. Gorospe, J. Kim, W.H. Koh, J. Z. Mason, D. McCauley, H. Murdoch, N. Nair, K. Neeti, S. Passarelli, A. Specht, **E. Sunderland**, A.Tekaieti, A. Tekiau, R. Tekoaua, E. Timeon. 2022. Study Protocol: Interactive dynamics between coral reef fisheries and the nutrition transition in Kiribati. *Frontiers in Public Health: Planetary Health*. 10: 890381.

106. S. Zolkos, A.V. Zhulidov, T.Y. Gurtovaya, V.V. Gordeev, S. Berdnikov, N. Pavlova, E.A. Kalko, Y. A. Kuklina, D.A. Zhulidov, L. S. Kosmenko, A. I. Shiklomanov, A. Suslova, B.M. Geyman, C. P. Thackray, **E.M. Sunderland**, S.E. Tank, J. W. McClelland, R. G.M. Spencer, D.P. Krabbenhoft, R. Robarts, R. M. Holmes. 2022. Multi-decadal declines in particulate mercury and sediment export from Russian rivers in the pan-Arctic basin. *Proceedings of the National Academy of Sciences of the United States of America*. 3(10), 344-350.

2021

105. A.K. Tokranov, D.R. LeBlanc, H. Pickard, B. Ruyle, L.B. Barber, R.B. Hull, **E.M. Sunderland**, C.D. Vecitis. 2021. Surface-water/groundwater boundary effects on seasonal PFAS concentrations and PFAA precursor transformations. *Environmental Science: Processes & Impacts.* 23, 1893-1905.

104. M. Bhatia, A. Specht, V. Ramya, D. Sulaiman, M. Konda, P. Balcom, **E.M. Sunderland**, A. Qureshi. 2021. Portable XRF as a rapid determination tool to detect ppm levels of Ni, Zn, As and Pb in human toenails: A South India case study. *Environmental Science & Technology*. 55(19): 13113-13121.

103. V. Shah, D.J. Jacob, C.P. Thackray, X. Wang, **E.M. Sunderland**, T. Dibble, A. Saiz-Lopez, I. Cernusak, V. Kello, P. Castro, R. Wu, C. Wang. 2021. Improved mechanistic understanding of the atmospheric redox chemistry of mercury. *Environmental Science & Technology*. 55(21): 14445-14456.

102. X.C. Hu, B. Ge, B. Ruyle, J. Sun, **E.M. Sunderland.** 2021. A statistical approach for identifying private wells susceptible to PFAS contamination. *Environmental Science & Technology Letters*. 8(7): 596-602.

101. M. Alcala-Orozco, P. Balcom, **E.M. Sunderland**, J. Olivero-Verbel, K. Caballero-Gallardo. 2021. Occurrence of essential and toxic elements in canned fish (sardines and tuna) commercialized in the Latin American market: Public health at stake. *Food Additives and Contaminants: Part B*. 14(3), 206-218.

100. M. Enrico, P. Balcom, D.T. Johnston, J. Foriel, **E.M. Sunderland**. 2021. Simultaneous combustion preparation for mercury isotope analysis and detection of total mercury using a direct mercury analyzer. *Analytica Chimica Acta*. 1154, 338327.

99. B. Ruyle, H. Pickard, D. LeBlanc, A. Tokranov, C. Thackray, X.C. Hu, C.D. Vecitis, **E.M. Sunderland**. 2021. Isolating the AFFF signature in coastal watersheds using oxidizable PFAS precursors and unexplained organofluorine. *Environmental Science & Technology*. 55(6): 3686-3695.

98. R.A. Stern, P. Koutrakis, M. Martins, B. Lemos, S.E. Dowd, **E. Sunderland**, E. Garshick. 2021. Characterization of Hospital Airborne SARS-CoV-2. *Respiratory Research*. 22:73.

97. Y. Zhang, S. Dutkiewicz, **E.M. Sunderland**. 2021. Impacts of climate change on methylmercury formation and bioaccumulation in the 21st century ocean. *One Earth*. 4(2): 279–288.

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5. Heyes, R.P. Mason, E-H. Kim, and **E. Sunderland**. 2006. Mercury methylation in estuaries. *Marine Chemistry.* 102: 134-147.

4. **E.M. Sunderland**, F.A.P.C. Gobas, A. Heyes, B. Branfireun, A. Bayer, R. Cranston, and M. Parsons. 2004. Speciation and bioavailability of mercury in well-mixed estuarine sediments. *Marine Chemistry.* 90: 91-105.

3. G.L. Chmura, L.L. Helmer, C.B. Beecher, and **E.M. Sunderland**. 2001. Historical rates of salt marsh accretion in the outer Bay of Fundy. *Canadian Journal of Earth Sciences*. 31: 1081-1092.

2. **E.M. Sunderland** and G.L. Chmura. 2000. An inventory of historical mercury emissions in Maritime Canada: Implications for present and future contamination. *The Science of the Total Environment.* 256(1): 39-57.

1. **E.M. Sunderland** and G.L. Chmura. 2000. The history of mercury emissions from fuel combustion in Maritime Canada. *Environmental Pollution*. 110(2): 297-306.

PERSPECTIVES, BOOK CHAPTERS & REPORTS

24. L.H.E. Winkel, **E.M. Sunderland**. 2022. Introduction to the biogeochemistry of trace elements themed issue. Environmental Science: Processes & Impacts, 24(9), 1277-1278.

23. R. Lohmann, **E.M. Sunderland**. 2021. Emerging questions in exposure, regulation, and remediation of PFAS. iScience. 24 (9). https://www.cell.com/iscience/pdf/S2589-0042(21)01022-1.pdf

22. R.S.D. Calder, A.T. Schartup, T. Bell, **E.M. Sunderland**. 2021. Muskrat Falls, methylmercury and Canadian hydroelectric development. In: Crocker, S and Crocker, L (Eds). ISER Books, Memorial University of Newfoundland, St. John's, NL.

21. **E.M. Sunderland** and C.C. Wagner. 2020. "The global chemical experiment." In P. Tortell (Ed.): Earth 2020 - An insider's guide to a rapidly changing planet., 1st ed., Pp. 185-193. Cambridge, UK: Open Book Publishers.

20. X.C. Hu, **E.M. Sunderland**, P. Grandjean. 2020. "Mercury" in *Environmental Toxicants – Human Exposures and Their Health Effects*, Eds. M. Lippmann, G.D. Leikauf, 4th Edition. Wiley. 1024 pp. ISBN: 978-1-119-43880-9.

19. **E.M. Sunderland**, H.M. Chan, W.L. Cheung. 2019. Fisheries and seafood security under changing oceans. In: *Predicting Future Oceans: Sustainability of Ocean and Human Systems Amidst Global Environmental Change*. Eds: A.M. Cisneros-Montemayor, W.L. Cheung, Y. Ota. Pp. 61- 68. Elsevier, Oxford, UK. ISBN: 978-0-12-817-945-1.

18. C.P. Thackray, **E.M. Sunderland**. 2019. Seafood methylmercury in a changing ocean. In: *Predicting Future Oceans: Sustainability of Ocean and Human Systems Amidst Global Environmental Change*. Eds: A.M. Cisneros-Montemayor, W.L. Cheung, Y. Ota. Pp. 61- 68. Elsevier, Oxford, UK. ISBN: 978-0-12-817-945-1.

17. C.A. Stock, William WL Cheung, J.L. Sarmiento, **E.M. Sunderland**. 2019. Changing Oceans: A Short Synthesis. In: *Predicting Future Oceans: Sustainability of Ocean and Human Systems Amidst Global Environmental Change*. Eds: A.M. Cisneros-Montemayor, W.L. Cheung, Y. Ota. Pp. 19- 34. Elsevier, Oxford, UK. ISBN: 978-0-12-817-945-1.

16. **E.M. Sunderland**, A.T Schartup. 2016. Biogeochemistry : Mercury Methylation on ice. *Nature Microbiology*. 1, 16165. DOI: 10.1038/nmicrobiol.2016.165.

15. **E.M. Sunderland,** C.T. Driscoll, Jr., J.K. Hammitt, P. Grandjean, J.S. Evans, J.D. Blum, C.Y. Chen, D.C. Evers, D.A. Jaffe, R.P. Mason, S. Goho, W. Jacobs. 2016. Benefits of regulating hazardous air pollutants from coal and oil-fired utilities in the United States (Perspective). *Environmental Science & Technology.* 50, 2117-2120.

14. A. Schartup, R. Calder, M. Li, P. Balcom, A. Valberg, J. Ewald, **E. Sunderland**. 2016. "Methylmercury" in Lake Melville: Avativut, Kanuittailinnivut (Our Environment, Our Health). Scientific Report, Nunatsiavut Government. Nain, Labrador.

13. **E.M. Sunderland**, J.G. Wiener, M.E. Brigham. 2014. Why is mercury in fish a concern? Chapter 2 in USGS Circular, The Quality of Our Nation's Waters: Mercury in the Nation's Streams – Levels, Trends, and Implications. Circular 1395. D.A. Wentz, M.E. Brigham, M.A. Lutz, D.P. Krabbenhoft (Eds.). 100 pp. Available: http://pubs.usgs.gov/circ/1395/ .

12. D.P. Krabbenhoft, **E.M. Sunderland**. 2013. Global change and mercury (Perspective). *Science.* 341 (6153), 1457-1458.

11. **E.M. Sunderland** and M. Tumpney. 2013. "Mercury in Foods." In: M. Rose, A. Fernandes. Persistent Organic Pollutants and Toxic Metals in Foods. Woodhead Publishing Series in Food Science, Technology and Nutrition No. 247. FERA, UK, pp. 392-413. ISBN-13: 978 0 85709 245 8.

10. Chen, C.Y., C.T. Driscoll, K.F. Lambert, R.P. Mason, L. Rardin, C.V. Schmitt, N.S. Serrell, and **E.M. Sunderland**. 2012. Sources to Seafood: Mercury Pollution in the Marine Environment. Hanover, NH: Toxic Metals Superfund Research Program, Dartmouth College.

9. A. Qureshi, M. MacLeod, **E. Sunderland**, and Hungerbühler, K. 2012. "Exchange of mercury between the oceans and atmosphere." In: G. Liu, Y. Cai, N. O'Driscoll. Environmental Chemistry and Toxicology of Mercury. John Wiley & Sons, Inc. Hoboken, New Jersey, USA, pp. 389-422. ISBN 978-0-470-57872-8.

8. International Joint Commission (**Workgroup contributor**), 2011. Risks and Benefits of Fish Consumption. Great Lakes Water Quality Agreement 2009-2011 Priority Cycle Report. International Joint Commission, Windsor, Ontario. ISBN: 978-1-927336-0308.

7. Hedgecock, N. Pirrone, A. Dastoor, L. Levin, C-J. Lin, R.P. Mason, **E. Sunderland**, O. Travnikov. 2010. Chapter 6: Summary. In: Hemispheric Transport of Air Pollution 2010, Part B: Mercury. N. Pirrone and T. Keating (Eds.) Air Pollution Studies No. 18. United Nations Economic Commission for Europe. United Nations, New York and Geneva.

6. **E.M. Sunderland**, E. Corbitt, D. Cossa, D. Evers, H. Friedli, D. Krabbenhoft, L. Levin, N. Pirrone, G. Rice. 2010. Impacts of Intercontinental Mercury Pollution on Human and Ecological Health. In: Hemispheric Transport of Air Pollution 2010, Part B: Mercury. N. Pirrone and T. Keating (Eds.) Air Pollution Studies No. 18. United Nations Economic Commission for Europe. United Nations, New York and Geneva.

5. **E.M. Sunderland,** C.D. Knightes, K. von Stackelberg, and N. Stiber. 2010. "Environmental Fate and Bioaccumulation Modeling at EPA: Application to Environmental Decision Making." In: G. Hanrahan (Ed.), Modelling of Pollutants in Complex Environmental Systems, Vol. II, ILM, UK, pp. 3-42.

4. U.S. EPA. 2009. *Final EPA Guidance on the Development, Evaluation and Application of Environmental Models.* (Principal authors: N. Gaber, P. Pascual, N. Stiber, **E. Sunderland**). EPA/100/K-09/003, EPA Council for Regulatory Environmental Modeling, Washington D.C, March 2009.

3. International Joint Commission. 2006. **Contributing author** to chapter: Development of a Multi-compartment Mercury Model for Lake Ontario: Tracking Mercury from Sources, Deposition and Dispersion to Fish and Accumulation in Humans. In: *Priorities 2003-2005. Priorities and Progress Under the Great Lakes Water Quality Agreement*. Chapter 2: 37-69.

2. U.S. EPA. 2005. **Lead author** for chapter: "*Ecosystem Scale Modeling for Mercury Benefits Assessment*." Chapter 3, Regulatory Impact Analysis of the Clean Air Mercury Rule, Final Report. EPA-452/R-05-003, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

1. EPA Council for Regulatory Environmental Modeling. 2003. *Interim EPA Guidance for the Development, Evaluation and Application of Regulatory Environmental Models*. (Principal authors: P. Pascual, N. Stiber, **E. Sunderland**). Washington DC.

INVITED PRESENTATIONS

2024

123. Invited Plenary Talk, 10th International Conference on Marine Pollution and Ecotoxicology (ICMPE-10). Hong Kong, January 3, 2024.

2023

123. Invited presentation, International Workshop of the Consortium for Analysis and Remediation of PFAS Japan, Tokyo Japan, October 18, 2023.

122. Invited panelist on Resources for the Future (RFF) webinar on Unplugging Emissions: Exploring New EPA Rules on Climate and Health. Virtual. May 19, 2023.

121. Invited presentation at the 10th Annual "Six Classes" Toxics Retreat IV, Sequoia Retreat Center, Ben Lomond, CA, April 24, 2023.

120. Invited talk. Social & Economic Impacts of PFAS in the Great Lakes/Lake Champlain Region. Illinois-Indiana Sea-Grant. Virtual presentation. March 8, 2023.

119. Invited plenary talk. US EPA National Forum on Contaminants in Fish. Virtual Meeting, February 28, 2023.

2022

118. Invited presentation. International symposium: *Sustainable and visionary health research in a changeable world.* University of Southern Denmark (SDU), Odense, Denmark. December 15, 2022.

117. Invited seminar. Environmental Science and Engineering Seminar Series. California Institute of Technology. Pasadena, CA, November 30, 2022.

116. Invited webinar. NIH Superfund Research Program Risk e-Learning Webinar Series: Climate Change and Health. Session II: Untangling Complex Exposures and Health Effects. November 4, 2022.

115. Invited seminar. The George Washington University, Environmental Engineering Seminar, October 14, 2022.

114. Invited webinar, Green Chemistry and Commerce Council (GC3), September 1, 2022.

113. Invited plenary talk, 12th International Symposium on Geochemistry of the Earth's Surface, Zurich, Switzerland, July 24-29, 2022.

112. Invited talk. Artic Monitoring and Assessment Network: Contaminants in Arctic wildlife and humans – cross-cutting issues. June 21, 2022.

111. Invited seminar. Earth, Ocean and Atmospheric Sciences, University of British Columbia, Vancouver, BC. June 15, 2022.

110. Invited talk. Ocean Nexus Center North American Meeting. Virtual. June 14, 2022.

109. Invited panelist. 9th Annual World Ocean Summit, Economist Impact, March 3, 2022.

2021

108. Invited podcast. The Economist Impact on: Chemical Pollution in the Ocean, Back to Blue Initiative. December 22. https://backtoblueinitiative.com/back-to-blue-podcasts/

107. Invited Congressional Testimony. House Science, Space, and Technology Subcommittees on Environment and on Research and Technology. December 7, 2021.

106. Invited keynote talk. FLUOROS Global 2021: International Perspective on PFAS Science. Virtual meeting. October 3, 2021.

105. Invited seminar, North Carolina State Superfund Research Program, September 28, 2021.

104. Invited panelist, Environmental Working Group Symposium on PFAS, July 14, 2021.

103. Invited talk, National Academies of Science, Engineering, and Medicine Consensus Study on "Guidance on PFAS Testing and Health Outcomes," July 13, 2021.

102. Invited talk. Massachusetts Interagency PFAS Task Force, Virtual, June 15, 2021.

101. Invited talk. Physical Geography Seminar Series, University College London, Virtual seminar, May 20, 2021.

100. Invited talk. Environmental Metrology and Policy Program, Georgetown University. Virtual seminar, April 29, 2021.

99. Invited talk. Hemispheric Transport of Air Pollution (HTAP) Fate and Transport Partnership meeting, April 13, 2021.

98. Invited panelist for "Dark Waters" film discussion on the business and societal impacts of drinking water contamination. Harvard Business School Food, Agriculture and Water Club. March 24, 2021.

97. Invited panelist for 2021 PFAS Workshop. Institute for Journalism and Natural Resources. Virtual panel, Jan 27, 2021.

2020

96. Invited panelist. Minamata Online: Multimedia modelling. United Nations Environment Programme. Nov. 17, 2020.

95. Invited talk. University of Michigan Lifestage Environmental Exposures and Disease Center. Oct. 7, 2020.

94. Invited seminar. NOAA Chemical Sciences Laboratory Seminar Series. September 9, 2020.

93. Keynote talk. Emerging Contaminants Summit. Denver, Colorado, March 11, 2020.

92. Invited seminar, Doctoral Seminar Series, College of Pharmacy and Health Sciences, St John's University, Queens, New York, February 24, 2020.

2019

92. Invited plenary talk, North American Deposition Program (NADP) Meeting, Boulder, Colorado, November 6, 2019.

91. Invited seminar, University of Pittsburgh, Civil and Environmental Engineering Seminar, Pittsburgh, PA, Oct. 11., 2019.

90. Invited seminar, Gijs van Seventer Lectureship in Environmental Health, Boston University, Boston, MA, Oct. 4, 2019.

89. Invited talk, Symposium on Faroese Research on Health and Environment, Tórshavn, Faroe Islands, August 30, 2019.

88. Invited seminar, Institute of Coastal Research, Helmholtz-Zentrum Geesthacht, Hamburg, Germany, August 26, 2019.

87. Invited seminar, New Insights in Atmospheric Science Seminar Series, US EPA, Research Triangle Park, NC, August 15, 2019.

86. Invited talk, ESTCP and SERDP PFAS Project Meeting, San Diego, CA, July 31, 2019.

85. Invited seminar, Department of Estuarine and Ocean Sciences, University of Massachusetts, Dartmouth, MA, March 20, 2019.

84. Invited seminar, University of Toronto, Center for Global Change Science Distinguished Lecturer Series. Toronto, Canada, January 8, 2019.

2018

83. Invited talk, Harvard Club of Portland, Portland, OR, June 20, 2018.

82. Invited seminar, University of Rhode Island Superfund Center Trainees, Kingston, RI, May 21, 2018.

81. Invited seminar, Agency for Toxic Substances and Disease Research (ATSDR), Atlanta, GA, May 10, 2018.

80. Invited seminar, Department of Earth, Ocean and Atmospheric Sciences Seminar Series, University of British Columbia, Vancouver, Canada, May 3, 2018.

79. Invited presentation at the "Six Classes" Toxics Retreat IV, Sequoia Retreat Center, Ben Lomond, CA, May 1.

78. Invited talk, Harvard Club of Cape Cod, Falmouth, MA, April 27, 2018.

77. Invited presentation, Northeast Regional Superfund Program Meeting, Woods Hole Oceanographic Institute, Woods Hole, MA, March 26, 2018.

76. Invited presentation, Nereus Symposium on Health of the Oceans, Nippon Foundation, Tokyo, Japan, Dec. 22, 2018.

2017

75. Invited talk, Hertz Foundation Fellows East Coast Retreat, Woods Hole, MA, September 24, 2017.

74. Invited keynote talk, Goldschmidt 2017, Paris, France, August 13-18, 2017.

73. Invited talk and plenary panel, 13th International Conference on Mercury as a Global Pollutant, Providence, RI, July 16-21, 2017.

72. Invited talk, Highly Fluorinated Compounds – Social and Scientific Discovery, Northeastern University, Boston MA, June 14, 2017.

71. Invited seminar, Washington Harvard Alumni Special Interest Group, Washington DC, May 22, 2017.
70. Invited seminar, Science, Technology and Environmental Policy Seminar, Princeton University, Princeton NJ, April 10, 2017.
69. Invited seminar, Climate Change and Global Health Seminar, Harvard Global Health Institute, Cambridge MA, February 2, 2017.
68. Invited talk, Harvard Standing Committee on Women Mini-Symposium, Cambridge MA, February 27, 2017.
67. Invited talk, Global Food+ 2017 Symposium, Cambridge MA, February 24, 2017.

2016

66. Invited seminar, Saturday of Symposia, Harvard Club of Boston, Boston MA, December 5, 2016.
65. Invited seminar, U.S. Environmental Protection Agency, Washington DC, November 28, 2016.
64. Invited seminar, Nereus Program, University of British Columbia: Adapting to Global Changes in Oceans and Fisheries, Vancouver BC, Canada, November 17, 2016.
63. Invited talk, UNEP Global Mercury Partnership consultation meeting, Portland, ME, October 13, 2016.
62. Plenary talk, 18th International Conference on Heavy Metals in the Environment, Ghent, Belgium, September 12, 2016.
61. Invited presentation, Methylmercury mitigation and Muskrat Falls workshop, Happy Valley - Goose Bay, Labrador, Canada, August 4, 2016.
60. Invited talk, Gordon Research Conference: Organic Geochemistry, Holderness School NH, July 28, 2016.
59. Invited seminar, NOAA Geophysical Fluid Dynamics Laboratory (GFDL) Seminar Series, Princeton NJ, April 28, 2016.
58. Technical lead, Nunatsiavut Government press conference on risks to Inuit health of Muskrat Falls development, St. John's NL, Canada, April 18, 2016.
57. Invited panelist, Center for Public Leadership, Belfer Center, Harvard Kennedy School, Cambridge MA, Panel on Women and Climate Change, Cambridge MA, March 29, 2016.

2015

56. Invited talk, Transatlantic Science Week 2015 speaker, Boston MA, November 5, 2015.
55. Invited speaker, Faculty Forum, Harvard Alumni Association, Cambridge MA, October 23, 2015.
54. Invited plenary speaker, Arctic Circle Assembly 2015 plenary talk, Reykjavík, Iceland, October 17, 2015.
53. Invited speaker, ScienceWriters2015.org, Cambridge, MA, October 12, 2015.
52. Invited seminar, Metals research core seminar, Harvard NIEHS Center, Harvard School of Public Health, Boston MA, October 1, 2015.
51. Invited speaker, Faculty Forum, Harvard Alumni Association, Cambridge MA, May 29, 2015.
50. Invited seminar, Environmental Geology & Geochemistry Seminar, Princeton University, Princeton NJ, May 14, 2015.
49. Invited talk, Goldschmidt2015, Prague, CZ, August 17, 2015.

2014

48. Invited keynote talk, Goldschmidt2014, Sacramento, CA, June 8, 2014.
47. Invited seminar, Environmental Science and Engineering Seminar Series, Harvard School of Engineering and Applied Sciences, Cambridge MA, March 14, 2014.
46. Discussion lead, Harvard University Center for the Environment, Cambridge MA, January 28, 2014.
45. Invited seminar, Department of Chemistry Seminar Series, University of British Columbia, Vancouver BC, Canada, January 21, 2014.

2013

44. Plenary speaker, 11th International Conference on Mercury as a Global Pollutant, Edinburgh, Scotland (presented for medical reasons by D.P. Krabbenhoft), August 1, 2013.

43. Invited seminar, Graduate School of Oceanography Seminar Series, University of Rhode Island, Narrangansett RI, April 26, 2013.

2012

42. Invited seminar, Dartmouth College Superfund Program Seminar Series, Hanover NH, October 16, 2012.
41. Plenary speaker, 16th International Conference on Heavy Metals in the Environment (ICHMET), Rome, Italy, September 24, 2012.
40. Invited talk, Mercury Science in the Great Lakes Workshop, Chicago IL. May 30-31, 2012.
39. Invited seminar, School of Marine and Atmospheric Sciences Seminar Series, Stony Brook University, Stony Brook NY, February 3., 2012.

2011

38. Invited talk, Gulf of Mexico Alliance Mercury Meeting, Gulf Breeze FL, October 18, 2011.
37. Invited seminar, Interdisciplinary Seminar Series, Lafayette College, Easton PA, September 26, 2011.
36. Invited seminar, Superfund Research Program Seminar Series, Harvard School of Public Health, Boston MA, March 7, 2011.

2010

35. Invited talk, Gordon Research Conference – Environmental Sciences: Water, Holderness NH, June 20-25, 2010.
34. Invited meeting lead, U.S. EPA Meeting on Global Mercury Emissions and U.S. Exposures, Washington, DC. Jan. 14, 2010.

Prior to 2010

33. Invited talk, Northeast and Great Lakes Region Mercury Science & Policy Conference, Chicago IL, November 18, 2009.
32. Invited talk, 10th National Forum on Contaminants in Fish, Portland OR, November 2-5, 2009.
31. Invited presentation, Session hosted by the National Institute for Minamata Disease (NIMD), 9th International Conference on Mercury as a Global Pollutant, Guiyang, China. June 7-12, 2009.
30. Invited presentation, UNECE/CLRTAP Task Force on Hemispheric Transport of Air Pollution, St. Petersburg, Russia, April 1-3, 2009.
29. Invited presentation, International Air Quality Advisory Board, Washington DC. April 15, 2009.
28. Invited talk, Gulf of Mexico Mercury Workshop, Gulfport MS, December 2-4, 2008.
27. Invited talk, 5th Annual Northwest Water Quality Modelers Meeting, Hood River OR, May 2-3, 2008.
26. Invited roundtable panelist, International Joint Commission Nearshore Priority Expert Consultation Part II, Dearborn MI, March 12-13, 2008.
25. Invited talk, Joint ASLO and AGU Ocean Sciences Meeting, Orlando FL. March 2-7, 2008.
24. Invited seminar, New England Tribal Council, Boston MA, December 11, 2007.
23. Invited seminar, US EPA Region 1 Science Council Seminar Series, Boston MA, August 29, 2007.
22. Invited seminar, New England Interstate Water Pollution Control Commission Fish Consumption Workgroup, Lowell MA, April 3, 2007.
21. Invited talks, Lake Ontario Contaminant Monitoring, Modeling and Research Workshop, Grand Island NY, March 27-28, 2007.
20. Invited seminar, Harvard Center for Risk Analysis Seminar Series, Harvard School of Public Health, Boston MA, March 5, 2007.
19. Invited talk, US EPA's Mercury Coordination Workgroup, Washington DC, February 28, 2007.
18. Invited seminar, Dartmouth Toxic Metals Research Program and Sea Grant Sponsored Workshop, Durham NH, November 15-16, 2006.
17. Invited seminar, Marine Science Program Seminar Series, University of Connecticut, Groton CT, October 13, 2006.
16. Invited seminar, NOAA Great Lakes Environmental Research Laboratory Seminar Series, Ann Arbor MI, September 14, 2006.

15. Invited talk, USGS/US EPA Roundtable on Mercury in the Environment, Washington DC, April 13, 2006.
14. Invited seminar, US EPA Region 1 Regional Science Council Seminar Series, Boston MA, March 1, 2006.
13. Invited seminar, University of British Columbia, School of Occupational and Environmental Hygiene Seminar Series, Vancouver BC, Canada, February 3, 2006.
12. Invited talk, US Army Corps of Engineers Committee on Water Quality, San Francisco CA, August 30, 2005.
11. Invited plenary talk, Shared Air Summit sponsored by the Premier of Ontario, Toronto ON, Canada, June 20, 2005.
10. Invited talks, Biennial Meeting of the International Joint Commission, Kingston ON, Canada. Two Invited talks. June 9-11, 2005.
9. Invited talk, NOAA- US EPA Scientist-to-Scientist Meeting on Multi-Media Aspects of Environmental Pollution in Coastal and Marine Environments. Laurel MD, June 2, 2005.
8. Invited seminars, Ontario Ministry of the Environment, Toronto/Dorset ON, Canada, April 20&22, 2005.
7. Invited talk, US EPA's Scientific Advisory Board, Panel on Regulatory Environmental Modeling, Washington DC, February 7-9, 2005.
6. Invited seminar, International Air Quality Advisory Board of the International Joint Commission, Vancouver BC, Canada, January 26, 2005.
5. Invited seminars, Department of Fisheries and Oceans Canada, Bedford Institute of Oceanography, Halifax NS, Canada, January 13&15, 2005.
4. Invited seminar, US EPA Mercury in Marine Life Workgroup, Office of Water. Washington DC, July 10, 2004.
3. Invited talk, USGS/US EPA Mercury Roundtable on Tools for Modeling Fish Bioaccumulation and Potential Health Effects, Washington DC, June 4, 2004.
2. Invited talk, 4th International Conference on Air Quality: Mercury, Trace Elements and Particulate Matter, Arlington VA, September 22-24, 2003.
1. Invited talk, Woodrow Wilson International Center for Scholars, Washington DC, June 20, 2003.

DECLARATION OF SUSAN F. TIERNEY, Ph.D.

I, Susan F. Tierney, declare as follows:

I. QUALIFICATIONS

1. I am a Senior Advisor at Analysis Group, a large consulting firm specializing in economics, finance and policy. My work focuses on energy and environmental economics, regulation, and policy in the electric industry and I have worked for clients in the public sector, the private sector, and others.

2. I previously served as the Assistant Secretary for Policy at the U.S. Department of Energy ("DOE"), and in Massachusetts I served as Secretary of Environmental Affairs, Commissioner of the Department of Public Utilities, and head of the state's Energy Facilities Siting Council. I have a Master's degree in City and Regional Planning and a Ph.D. in regional planning from Cornell University.

3. I chair the Board on Energy and Environmental Systems at the National Academies of Sciences, Engineering and Medicine and have served on numerous National Academies' expert committees focusing on electric-system transition issues. I am a member of the New York State Independent System Operator's Environmental Advisory Committee, and previously chaired the DOE's Electricity Advisory Committee. I currently chair the board of Resources for the Future and am vice-chair of the board of World Resources Institute.

4. I have written extensively on topics relevant to transitions underway in the electric industry over the past three decades and in future years,[1] and on

[1] *See* Attachment 1 to this declaration for a list of some of my relevant reports, white papers, and testimony. A detailed curriculum vitae with my experience can be found at: https://www.analysisgroup.com/globalassets/content/experts_and_staff/senior_adivsors/tierney_cv.pdf.

mechanisms, institutions and processes for ensuring electric system reliability.[2] I have testified on such issues before Congressional committees and spoken at expert meetings. Of particular relevance to this declaration, I have authored or co-authored reports on anticipated impacts of environmental regulations on power system reliability, and I have been invited to speak on such topics at technical conferences hosted by the Federal Energy Regulatory Commission ("FERC"), the federal agency with statutory responsibility for overseeing electric reliability.[3] I have recently written a declaration on electric-reliability issues which was submitted as part of the Opposition of Environmental and Public Health Respondent-Intervenors to Petitioners' Stay Motions in the challenge to the Environmental Protection Agency's ("EPA") final rules to limit greenhouse gas ("GHG") emissions from certain fossil-fueled power plants.[4]

5. I understand that the new national standards for emissions of hazardous air pollutants ("HAPs") from coal- and oil-fired electric generating units ("EGUs"),[5] published in May 2024 by the EPA, build on the existing Mercury and Air Toxics Standards ("MATS") established in 2012, rely on the analyses conducted as part of a new Technology Review, and include three core elements.[6]

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[2] *See* Susan Tierney, "Electric System Reliability and EPA's Regulation of GHG Emissions from Power Plants: 2023" (Nov. 7, 2023) (hereinafter "Tierney 2023 Reliability Report") (including Susan Tierney et al., "Electric System Reliability and the EPA's Clean Power Plan: Tools and Practices" (Feb. 2015) (hereinafter "Tierney et al. Electric Reliability Tools Report") (attached to this report as Attachment 2)).

[3] *See* Tierney 2023 Reliability Report.

[4] *See* West Virginia et al. v. EPA, No. 24-1120, Opposition of Environmental and Public Health Respondent-Intervenors to Stay Motions, Att. 9 (D.C. Cir., June 11, 2024); 89 Fed. Reg. 39,798 (May 9, 2024).

[5] I refer here to the standards as "2024 MATS Rule." EPA, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*, 89 Fed. Reg. 38,508 (May 7, 2024). (This rule is sometimes called the "Mercury and Air Toxics Rule" ("MATS Rule").)

[6] The 2024 MATS Rule: (a) sets further emission limitations for non-mercury HAPs for existing

They provide that affected EGUs will have the maximum legislatively allowed compliance period (i.e., three years after the July 8, 2024 effective date of the new rule) with the opportunity to apply for a one-year extension (i.e., a fourth year – through July 2028) to comply if warranted for electric-system reliability and other considerations.[7]

II. SUMMARY OF CONCLUSIONS:

6. ***Electric reliability organizations plan continually for reliability in a changing electric system regardless of the 2024 MATS Rule.*** The electric system is not static; it evolves over time, with changes on both the supply and demand sides of the system. Prudent electric service providers and other reliability entities effectively assess and plan for system needs on a continuing basis because changes occur all the time. There are changes in generating technologies' performance and costs, the prices of fuels, the configuration of the grid, legal and regulatory policy requirements and opportunities, consumer preferences, and other factors. These changes can affect the economics of existing and new power plants, and often lead unit owners to make changes in their supply portfolios. The 2024 MATS Rule's tighter emissions standards (which are expected to affect 2% of the nation's generating capacity as of 2023) introduce only incremental changes to the underlying requirement that asset owners prudently examine the going-forward economics of their EGUs in light of these myriad changes.

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coal-fueled steam generating units; (b) tightens the emissions standard for mercury for existing lignite-fired coal EGUs so that they must meet an emission standard consistent with what is now required of other coal-fired EGUs under the current MATS; and (c) requires that existing coal- and oil-fired units demonstrate their compliance with the new standards using continuous emissions monitoring systems ("CEMS"), which EPA estimates already exists at two-thirds of existing coal-fired EGUs. EPA, "Fact Sheet: EPA's Final Rule to Strengthen and Update the Mercury and Air Toxics Standards for Power Plants," https://www.epa.gov/system/files/documents/2024-04/fact-sheet_mats-rtr-final_rule_2024.pdf.

[7] 89 Fed. Reg. 38,508, 38,509, 38,526 (May 7, 2024).

7. ***The 2024 MATS Rule accommodates electric-system reliability needs***. EPA is clearly aware of the changes occurring in the industry. EPA conferred with federal agencies and others with reliability responsibility as part of its rulemaking process and took reliability issues into account in the design of the new rules.[8] The vast majority (98%) of the nation's total generating capacity is not affected by the stricter emissions limits of the 2024 MATS Rule at all, and EPA has concluded that the small number of EGUs that are affected by the rule will be able to comply within the deadlines it establishes. Out of the roughly 22,000 total existing generating units (of all fuel types) currently in operation, 33 coal-fired units may need to make upgrades to comply with the fPM standards. In total, EPA estimates that 27 plants may need to "upgrade existing controls" to comply with the more stringent emissions standards under the rule: 20 plants may need upgrades to comply with the updated fPM standards and 10 lignite plants may have to make changes to comply with the revised mercury-emissions standard.[9] EPA estimates that most of the units affected by the fPM limit are expected to incur only minimal additional operations and maintenance costs with no capital upgrades required.[10] In 2023, these EGUs produced 3% of total U.S. electricity supply.[11] (By contrast, the 2012 MATS rule affected units that produced 37% of the nation's electricity generation at that time.) The 2024 MATS Rule includes provisions to address circumstances where compliance deadlines are challenging from an electric-

[8] 89 Fed. Reg. 38,508, 38,519, 38,526 (May 7, 2024).

[9] EPA, "Mercury and Air Toxics Standards (MATS) for Coal-Fired Power Plants Review of the 2020 Residual Risk and Technology Review (RTR) Final Rule April 25, 2024," slide 11 (hereafter "EPA's MATS Presentation"), https://www.epa.gov/system/files/documents/2024-04/presentation_mats_final-2024-4-24-2024.pdf. Note that three plants may require both fPM and lignite upgrades, accounting for the difference between the total of 27 plants and sum of the 20 plants with potential fPM upgrades and 10 lignite plants with potential upgrades.

[10] 89 Fed. Reg. 38,508, 38,534 (May 7, 2024).

[11] For clarity, these EGUs accounted for 2% of total U.S. generating capacity in 2023, and they produced 3% of total electricity generation in that year.

reliability point of view.

8. ***The 2024 MATS Rule will not jeopardize reliability and will certainly not trigger reliability issues in the near term.*** No generating unit need retire in the next few years as a result of this rule. No plant need meet new emission limits (or retire) before the new rule's compliance deadlines (i.e., July 2027, or 2028 if warranted for reliability concerns). It is misleading to suggest that there will be immediate and irreparable impacts on grid reliability if the rule remains in place during this litigation. There is precedent for DOE's use of its authority under Section 202(c) of the Federal Power Act ("FPA") to ensure that a generating unit remain in operation – despite its owner's intention to retire it rather than to take other steps to comply with air pollution standards – to maintain local reliability until such time as other actions are in place to mitigate the reliability concern. Also, it is inaccurate to say that the EPA did not examine or assess the reliability impacts of the 2024 MATS Rule. Similarly, it is inaccurate to conclude that parties' studies that examine the *economic* value of EGUs (e.g., Colstrip analyses, North Dakota Transmission Authority study) indicate whether an EGU is needed for *reliability* purposes.

9. ***The continued pattern of retirements of coal-fired power plants in the past two decades has been driven primarily by fundamental energy-market economics (e.g., low gas prices, entry of wind and solar projects) and not the prior MATS rule, and it is unreasonable to conclude that coal-fired EGUs would continue to operate indefinitely in the absence of the new rule.*** For example, the coal-fired EGU capacity located in North Dakota will have an average age of 47 years in 2027 (the compliance date of the new rule). The expected continued entry of new renewable generating capacity and competition from low-cost gas-fired generation will put economic pressure on operations at coal units and it seems inappropriate to suggest that retirement of such units would be either "premature"

or driven by the 2024 MATS Rule. It is also incorrect to suggest (a) that in the lead-up to the prior 2012 MATS rule, EPA erred by estimating that that rule would lead to 5 gigawatts ("GW") of coal-plant retirements but (b) that the rule actually caused nearly 60 GW to retire. During the period from 2012 through 2015 (not to mention before and after that period), low-cost power production at natural gas units and renewable projects made it uneconomic to continue to spend money to maintain many coal EGUs in operation and was primarily responsible for the 40 GW of coal plant retirements in those years).

10. In this declaration, I address electric-system reliability implications of the 2024 MATS Rule, and specifically during the first one to two years in which I understand this litigation will be ongoing. In the following sections, I define some key technical terms and concepts that I discuss in my declaration and provide the factual basis for my specific opinions about reliability, organized according to my key summary conclusions (above).

III. KEY ELECTRIC RELIABILITY CONCEPTS AND TERMINOLOGY

11. In the electric industry, the term "reliability" relates to the operating practices and attributes of a system of generation, transmission, distribution facilities, operational techniques, controls, and measures to moderate electricity demand.

12. To clarify important nuances often swept into the ways the word "reliability" is used, I note several distinctions that are important in the electric industry.[12]

[12] These descriptions are based on my many decades of experience in the electric industry and its regulation, as well as my participation in several National Academies' studies. *See, e.g.,* National Academies of Sciences, Engineering and Medicine, *Enhancing the Resilience of the Nation's Electricity System*, 2017, https://doi.org/10.17226/24836.

- *Bulk power system reliability*: Reliability in this context relates to the ability of the high-voltage grid to maintain operation without the occurrence of an involuntary outage due to insufficient resources. Outages at the bulk power level can result from major weather events and natural disasters that damage EGUs, fuel-delivery infrastructure, and/or transmission lines, and very rarely result from having insufficient supply to meet demand.
- *Distribution system reliability*: This refers to the far-more-common outages that result from weather, accidents, or equipment failures that affect the local wires and other local infrastructure connecting consumers to the grid.

13. The North American Electric Reliability Corporation ("NERC"), which sets mandatory reliability standards for the electric industry under the authority of the FERC, has defined core reliability concepts and terms,[13] including:

- *"Adequacy."* Given the resources installed on a system, adequacy is a system's ability to "supply the aggregate electrical demand and energy requirements of the end-use customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements."
- *"Operating reliability."* "The ability of the bulk power system to withstand sudden disturbances, such as electric short circuits or the unanticipated loss of system elements from credible contingencies, while avoiding uncontrolled cascading blackouts or damage to equipment."

14. Given that electric system "reliability" focuses on avoiding involuntary outage events, it is misleading to refer to some technologies (e.g., coal units) as being reliable or as having reliability attributes and others as not (e.g., wind

[13] NERC, Glossary of Terms Used in NERC Reliability Standards (upd. May 8, 2024), https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf.

plants).

15. Electric systems (e.g., a utility's own electric system, and/or a regional system operated by an independent Regional Transmission Organization ("RTO")) are traditionally planned to ensure there are adequate resources installed on or available to a system to meet the projected hour of peak demand with a reserve margin in case planned and unplanned equipment outages occur on the system.

16. Additionally, at any moment in an electrical control area (where the resources are under the dispatch direction of a single "balancing authority" entity), supply and demand must constantly be in balance, with some resources ready to ramp operations up or down in the event of changes in demand, an unexpected equipment outage, or other events so that supply equals demand.

17. In a reliable and economic electric system, resources available to the grid operator tend to be operated according to the principle of economic dispatch, meaning that as demand rises and falls over the course of a day, power plants are dispatched so as to minimize the cost of producing power. Wind, hydropower, solar, and nuclear facilities tend to be dispatched whenever available, as they have the lowest marginal total cost of power production. Fossil generation, which has fuel costs, is then dispatched to fully satisfy demand. Shifts in the output of individual plants occur on a nearly continuous basis given changes in demand and in the relative cost of producing power across available resource options.

18. The *economic* dispatch of generating resources relates more to the costs to produce electricity rather than to serve as a measure of the *reliability* of the grid (e.g., probability of an outage; violation of a reliability standard). Reliability studies focus on issues of resource adequacy (e.g., having enough resources to meet peak and reserve requirements) and operational reliability (e.g., power flows on the system, given infrastructure, demand and dispatch considerations). Most

economic studies (e.g., North Dakota's 2024 study[14]) do not provide insights into whether outages are likely to occur on the grid.

IV. ELECTRIC RELIABILITY ORGANIZATIONS PLAN CONTINUALLY FOR RELIABILITY IN A CHANGING ELECTRIC SYSTEM REGARDLESS OF THE 2024 MATS RULE

19. Across the U.S., the electric system is already undergoing significant transitions, driven primarily by: relatively attractive prices for efficient power generation produced by natural gas, wind and solar projects; relatively poor economics of many older and less efficient fossil-fueled power plants; and federal and state policies and consumer preferences supporting the addition and retention of new and existing renewable and zero-carbon electricity supplies.[15]

20. Recently, electricity demand has started to grow slowly after two decades of relatively flat demand. Overall growth in electricity sales in the short term is projected to be less than 1% a year (2022 through 2025), according to the Energy Information Administration ("EIA").[16] EIA projects higher-than-average annual growth in the West/South Central (3.6%), West/North Central (2.4%) and South Atlantic (2.4%) regions, with other regions having much slower growth.

21. About 240 GW of aged and/or uneconomic generating capacity have retired since 2010 (including 130 GW of coal capacity,[17] 87 GW of gas and/or oil capacity, and 10 GW of nuclear capacity). During that period, the nation added 433

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[14] North Dakota Transmission Authority, "Analysis of Proposed EPA MATS Residual Risk and Technology Review and Potential Effects on Grid Reliability in North Dakota" (April 3, 2024), submitted in State of North Dakota et al. v. EPA, Motion for Stay, No. 24-1119, Exh. 9, Att. F (D.C. Cir., June 7, 2024) (hereinafter "North Dakota Study").

[15] Tierney 2023 Reliability Report.

[16] EIA, Short-Term Energy Outlook, Table 7b (May 2024).

[17] Only 40 GW of the 130 GW of coal capacity retirements occurred during the 2012-2015 period after the adoption of the prior 2012 MATS rule. EIA 860 Data for the inventory of utility-scale generating capacity as of the end of 2023.

GW of generating capacity comprised of gas-fired units (132 GW), wind projects (116 GW), solar projects (98 GW of utility-scale projects plus 47 GW of rooftop solar), batteries (17 GW), and coal-fired capacity (14 GW).[18]

22. In recent years, these developments unrelated to the 2024 MATS Rule have substantially changed the profile of the U.S. electric system. As of March 2024, owners of 46 GW of existing coal-fired capacity have announced plans to retire those units before 2032. Planning for such retirements has been underway for years and is not being triggered by the just-finalized 2024 MATS Rule.

23. With these changes already underway, the 2024 MATS Rule affects only a small portion of the electric system. The vast majority (98%) of the nation's generating capacity is not likely to be affected at all by the EPA Rule's stricter emissions requirements.[19] EPA estimates that 33 coal-fired EGUs may need to make upgrades to comply with the fPM standards.[20] EPA estimates that most of the units affected by the fPM limit are expected to incur only minimal additional operations and maintenance costs with no capital upgrades required.[21] In total, 27 generating stations may require upgrades to comply with the more stringent emissions standards for mercury and other toxic metals under the rule. In 2023, these EGUs produced 3% of total U.S. electricity supply.[22] (By contrast, the 2012 MATS rule affected units that produced 37% of the nation's electricity generation

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[18] EIA 860 Data (for the inventory of utility-scale generating capacity as of the end of 2023); EIA 861 Data (for behind-the-meter solar capacity is as of end of 2023, all states, photovoltaic under net metering tariffs). The last new coal plant to enter service was in 2014.

[19] This percentage includes: (a) all fossil and non-fossil generating capacity (e.g., nuclear, hydroelectric, geothermal, wind, solar, and distributed generating (e.g., rooftop solar). EIA, Preliminary Monthly Electric Generator Inventory (Apr. 24, 2024) (providing detailed generating unit-specific data).

[20] EPA's MATS Presentation.

[21] 89 Fed. Reg. 38,508, 38,534 (May 7, 2024).

[22] For clarity, these EGUs accounted for 2% of total U.S. generating capacity in 2023, and they produced 3% of total electricity generation in that year.

at that time.)

24. With or without EPA's rule, entities responsible for maintaining the electric grid need to take action in the near term to address current reliability issues. Indeed, around the country, countless entities – utility companies, some RTOs, reliability organizations like FERC and NERC, and state regulators – are already focusing on and addressing near-term power-system operational issues so as to assure reliable operations around the clock. Electricity outages (or near outages) have occurred recently in parts of the bulk-power system, most notably in Texas and in the Mid-Atlantic and Southeastern parts of the U.S.,[23] but those risks have nothing to do with the 2024 MATS Rule. Those actual and near-miss outages occurred during periods of extreme winter weather, affected substantially by problems in fuel delivery to and operations of fossil power plants. A recent statement issued by one RTO before the 2024 MATS Rule was finalized calls upon "the entire industry – utilities, states and MISO" to work together to address the "immediate and serious challenges" that currently exist on the nation's electric system.[24] This coordinated action is what is needed to "safeguard" grid reliability[25] (rather than a court-ordered stay of the 2024 MATS Rule).

25. The electric system is always evolving, and any changes introduced by the 2024 MATS Rule (along with any additional resource planning needs to which

[23] *See* FERC, NERC and Regional Entity Staff Report, "The February 2021 Cold Weather Outages in Texas and the South Central United States" at 1, 2, 16 (Nov. 2021), https://www.ferc.gov/media/february-2021-cold-weather-outages-texas-and-south-central-united-states-ferc-nerc-and; FERC, NERC, and Regional Entity Joint Staff Inquiry, "December 2022 Winter Storm Elliott Grid Operations: Key Findings and Recommendations" at 2, 5, 13 (Sept. 21, 2023), https://ferc.gov/sites/default/files/2023-09/Presentation%20-%20Elliott_F-R_Open_Mtg_%289-21-23%29.pdf.

[24] MISO, "MISO's Response to the Reliability Imperative" (upd. Feb. 2024), https://cdn.misoenergy.org/2024%20Reliability%20Imperative%20report%20Feb.%2021%20Final504018.pdf.

[25] The North Dakota Study also states that urgent action is needed to address grid reliability. North Dakota Study at 10.

it contributes) are incremental to what is needed for normal system planning activities. Electric utilities conducting on-going and prudent resource planning are fully aware of the fundamental changes underway on the electric grid and will not be starting from scratch to consider their options for assuring a reliable and economical supply of electricity for their customers.

26. Prudent resource planning and decision-making always focuses on going-forward costs of maintaining and operating existing generation compared to other alternatives. The going-forward operations and lifetime of a generating unit never result from a single factor; rather, prudent resource investment and operating life decisions always take into account many factors, including new investment to maintain an existing EGU in good operating condition, its operating costs (e.g., fuel), how such costs compare to the operating costs of other plants, the operating attributes of generating units (e.g., their start-up times, time to "ramp" the unit's output up and down), any new financial incentives (such as those included in new federal statutes), or a new environmental rule. It is just such prudent planning and decision-making (and not the 2024 MATS Rule) that led plant owners to retire units that were relatively costly to maintain and operate, and to have already announced the future retirement dates of nearly 70 GW of capacity at fossil steam EGUs.[26]

27. Even without the 2024 MATS Rule, prudent resource planning and decision-making by owners will surely lead to additional retirements of aging infrastructure. Calling such retirements "premature" is inapt in light of the fact that by 2027, 89% of the coal-fired generating capacity on EPA's list of affected units

[26] EIA, Preliminary Monthly Electric Generator Inventory (Release Date Apr. 24, 2023) (hereafter "EIA Generator Inventory"), https://www.eia.gov/electricity/data/eia860m/.

will be at least 40 years old (and 41% of such capacity will be over 50 years).[27] Keeping such old power plant capacity in efficient, safe and economical operating condition requires significant continued investment.

28. Ensuring affordable and reliable electricity requires continual planning and action by many entities including the parties bringing these lawsuits – activities that prudent resource managers would undertake in any event. The responsibilities of organizations such as electric utilities, state regulators, and RTOs include ensuring reliable service. These organizations are part of an expansive and mission-driven set of entities with responsibility for reliability and with a robust tool kit of actions that can be taken to address assurance of reliability.[28] Decades of experience in the electric industry indicates that they will take combinations of actions to help ensure the reliable service they seek to safeguard. This has always occurred as changes in the electric system require action to ensure continued uninterrupted supply of power to consumers.[29]

29. As I have written elsewhere,[30] a "common theme in past EPA efforts to control air pollution from existing power plants is concern that the implementation of new rules will harm electric system reliability. Yet past implementation of such regulations has not led to such outcomes, in large part due to the existence and use of various tools to ensure reliable operations of the system." In every past instance when such reliability concerns were raised by commenters, "the industry predictably stepped up to ensure that reliability was not compromised – mainly because these many tools are available and because power plant owners, reliability

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[27] EIA 860 Data for the inventory of utility-scale generating capacity as of the end of 2023 (EIA Generator Inventory), matched with generating units listed on EPA's MATS Presentation.

[28] *See* Tierney et al. Electric Reliability Tools Report (included in Attachment 2).

[29] Tierney 2023 Reliability Report (Attachment 2).

[30] Tierney 2023 Reliability Report (Attachment 2).

organizations, regulators, other public officials, and a wide range of other stakeholders took myriad actions to ensure that the grid as a whole performed its essential public service functions."[31]

30. The resources installed on the electric system across the country will continue to evolve for reasons entirely unrelated to the 2024 MATS Rule. As the EPA notes in its rulemaking analyses, the electric generation system in the U.S. is undergoing a significant transition.[32] Multiple databases that track current company plans to add new utility-scale generating capacity – e.g., EIA's inventory of planned generating units,[33] Lawrence Berkeley Laboratory,[34] and S&P Global[35] – indicate a strong list of projects even before the 2024 MATS Rule was announced. Additionally, other new and as-yet unidentified projects will be supported through various incentives including:[36] the Inflation Reduction Act's tax incentive

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[31] Tierney 2023 Reliability Report (Attachment 2). *See also* 89 Fed. Reg. 38,508 at 38,526 (May 7, 2024).

[32] *See* 89 Fed. Reg. 38,508, 38,534 (May 7, 2024); EPA, "Regulatory Impact Analysis for the Final National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review," Chapter 2 (April 2024).

[33] EIA, Generator Inventory: 163 GW of current planned specific utility-scale projects through 2030, a large portion of which is under construction and/or in receipt of regulatory approvals, with: 81.9 GW of solar; 31.4 GW of battery storage; 20.4 GW of onshore wind; 19.3 GW of gas-fired capacity; 5.3 GW of offshore wind; 3.1 GW of other renewable projects; 1.1 GW of nuclear; and other (e.g., petroleum liquids).

[34] "Active" capacity in the nation's interconnection queues as of the end of 2023 lists 2,598 GW of capacity. Lawrence Berkeley National Laboratory, Generation, Storage, and Hybrid Capacity in Interconnection Queues, https://emp.lbl.gov/generation-storage-and-hybrid-capacity.

[35] Karin Rives, "US has 133 new gas-fired power plants in the works putting climate goals at risk" (May 15, 2024), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/us-has-133-new-gas-fired-plants-in-the-works-putting-climate-goals-at-risk-81469493.

[36] See, for example, the Executive Summary and Figure ES-1 in the recent paper my colleagues and I have written to explain the many financial incentives in the IRA and Infrastructure Investment and Jobs Act ("IIJA") that are available to electric utilities to ensure the prudent provision of efficient and reliable electricity supply. Paul Hibbard, Susan Tierney & Daniel

programs administered by the U.S. Treasury Department; the EPA's Greenhouse Gas Reduction Fund;[37] the DOE's Clean Energy Financing Program and its Energy Infrastructure Investment fund;[38] the DOE's Grid Resilience and Innovation Partnerships Program;[39] the U.S. Department of Agriculture's Rural Utilities Service;[40] and state policies (e.g., net-metered rooftop solar systems; renewable portfolio standards; clean energy standards).[41]

V. THE 2024 MATS RULE ACCOMMODATES AND SUPPORTS ELECTRIC SYSTEM RELIABILITY

31. While EPA is not responsible for maintaining electric reliability, the agency has undertaken considerable effort to understand and analyze the implications of potential rule changes on the electric industry's ability to provide electricity responsibly and reliably.[42] EPA took such circumstances (including reliability issues) into account in its consideration of the record and its design of

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Stuart, "Electric Utilities and the IIJA/IRA: Ensuring Maximum Benefits for Consumers from New Federal Funding Opportunities" (Jan. 2024), https://www.analysisgroup.com/globalassets/insights/publishing/2024-electric-utilities-and-the-ira-iija.pdf.

[37] *See* EPA, Greenhouse Gas Reduction Fund, https://www.epa.gov/greenhouse-gas-reduction-fund.

[38] *See* DOE, Energy Infrastructure Reinvestment Loan Programs Office, https://www.energy.gov/lpo/energy-infrastructure-reinvestment.

[39] *See* DOE, Grid Resilience and Innovation Partnerships Program, https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program.

[40] *See* USDA Rural Development, Powering Affordable Clean Energy Program & Empowering Rural America Program FAQs, https://www.rd.usda.gov/media/file/download/pace-faqs-v6-09012023.pdf.

[41] *See* National Academies of Sciences, Engineering & Medicine, "Accelerating the Decarbonization of the U.S. Energy System," chapter 6 at 316-17, fig. 6-2 (2023), https://nap.nationalacademies.org/catalog/25932/accelerating-decarbonization-of-the-us-energy-system (showing state policies).

[42] *See, e.g.,* 89 Fed. Reg. 38,508, 38,526 (May 7, 2024).

new power plant rules.[43]

32. EPA consulted with the DOE and FERC (including participating in FERC's electric reliability workshop),[44] utilities and other grid operators (e.g., RTOs), experts in grid reliability, and others in the electric industry on electric reliability issues. EPA entered into a memorandum of understanding with the DOE to coordinate on grid reliability issues.[45] EPA received and reviewed comments on reliability issues submitted by entities in the MATS rulemaking docket. EPA explained in detail how it analyzed reliability issues, the provisions in the rule (e.g., the potential for unit owners to request a fourth year to comply with the rule) that intersect with electric-system reliability, and the agency's recognition of the parallel responsibilities of the many reliability institutions and industry tools that exist to address electric system reliability in the future.[46] EPA concluded that its

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[43] *See, e.g.,* 89 Fed. Reg. 38,508, 38,519, 38,526 (May 7, 2024); EPA, "Power Sector Trends: Technical Support Document," Docket ID No. EPA-HQ-OAR-2023-0072 (April 2024) (prepared in the parallel rulemaking on GHG emissions from power plants).

[44] *See* "Prepared Statement of Joseph Goffman, Principal Deputy Assistant Administrator Office of Air and Radiation, United States Environmental Protection Agency," presented to the FERC Reliability Technical Conference, Docket No. AD23-9-000 (Nov. 9, 2023), https://www.ferc.gov/media/statement-joseph-goffman-principal-deputy-assistant-administrator-office-air-and-radiation.

[45] DOE & EPA, "Joint Memorandum of Understanding on Interagency Communication and Consultation on Electric Reliability" (Mar. 2023), https://www.epa.gov/system/files/documents/2023-03/DOE-EPA%20Electric%20Reliability%20MOU.pdf.

[46] *See* EPA, "Resource Adequacy Analysis Technical Support Document Final National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review," Docket ID No. EPA–HQ–OAR–2018–0794, at 2-3 (Apr. 2024), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-6918 ("EPA's role in regulating emissions from electric generating units does not include specifying generation resource mixes or grid operations and planning practices. Thus, EPA does not conduct operational reliability studies. Rather, in this document, EPA describes its modeling of the projected impact of the final rule, and finds that projected impacts to the resource mix are negligible….The EPA does not project that any EGUs will retire in response to the standards promulgated in this final rule."). *See also* 89 Fed. Reg. 38,508, 38,526 (May 7, 2024) ("The EPA understands that before implementing such a retirement decision, the unit's owner will follow the

rule would not jeopardize electric system reliability either alone or in combination with EPA's other power plant rules.[47]

33. EPA explained that the final rule includes a provision that addresses some of the reliability concerns that had been expressed by commenters: The agency "has granted the maximum time allowed for compliance under CAA section 112(i)(3) of 3 years, and individual facilities may seek, if warranted, an

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processes put in place by the relevant regional transmission organization (RTO), balancing authority, or state regulator to protect electric system reliability. These processes typically include analysis of the potential impacts of the proposed EGU retirement on electrical system reliability, identification of options for mitigating any identified adverse impacts, and, in some cases, temporary provision of additional revenues to support the EGU's continued operation until longer-term mitigation measures can be put in place. No commenter stated that this rule would somehow authorize any EGU owner to unilaterally retire a unit without following these processes, yet some commenters nevertheless assume without any rationale that is how multiple EGU owners would proceed, in violation of their obligations to RTOs, balancing authorities, or state regulators relating to the provision of reliable electric service."); EPA, "Resource Adequacy Analysis: Vehicle Rules, Final 111 EGU Rules, ELG and MATS RTR Technical Memo," Docket ID No. EPA-HQ-OAR-2023-0072-8915, at 11-12 (Apr. 2024) ("Power companies, grid operators, and regulators have well-established, adaptive procedures and policies in place to preserve electric reliability in response to system changes. Grid operators administer adaptive programs, such as capacity markets and resource adequacy programs, designed to require or incentivize medium- and long-term investment in the resources that will be needed to meet demand. In many states, regulators oversee planning by utilities to ensure that there is a diverse portfolio of generating resources with the qualities and attributes needed to reliably meet electricity demand. The Federal Energy Regulatory Commission, in partnership with the North American Electric Reliability Corporation and regional reliability organizations, establishes and enforces standards that transmission and generation utilities must meet to ensure operational reliability. Over shorter time horizons, grid operators and regulators have rules that require utilities to follow processes designed to protect reliability before making major plant modifications or retirement decisions.").

[47] EPA, "Resource Adequacy Analysis: Vehicle Rules, Final 111 EGU Rules, ELG and MATS RTR Technical Memo," Docket ID No. EPA-HQ-OAR-2023-0072-8915, at 3 (Apr. 2024) (concluding that "the impacts of both the 111 EGU Rules [i.e., EPA's rule to control greenhouse gas emissions from power plants] alone and combined with other recent EPA actions related to electricity generating units are projected to result in anticipated power grid changes that (1) remain within the confines of key North American Electric Reliability Corporation (NERC) assumptions, (2) are consistent with peer reviewed projections for the power sector, and (3) are consistent with goals, planning efforts and Integrated Resource Plans (IRPs) of industry itself. We project that the 111 EGU Rules, whether alone or combined with other Rules, are unlikely to adversely affect resource adequacy.") (footnotes omitted).

additional 1-year extension of the compliance date from their permitting authority pursuant to CAA section 112(i)(3)(B). The construction of any additional pollution control technology that EGUs might install for compliance with this rule can be completed within this time and will not require significant outages beyond what is regularly scheduled for typical maintenance."[48]

34. The 2024 MATS Rule also explains the DOE's authority, under Section 202(c) of the FPA.[49] This provision allows the Secretary of Energy (as EPA has described in its new rule to control GHG emissions from certain EGUs) to order

> the temporary generation of electricity from particular sources in certain emergency conditions, including during events that would result in a shortage of electric energy, when the Secretary of Energy determines that doing so will meet the emergency and serve the public interest. An affected source operating pursuant to such an order is deemed not to be operating in violation of its environmental requirements …. DOE has historically issued section 202(c) orders at the request of electric generators and grid operators such as RTOs in order to enable the supply of additional generation in times of expected emergency-related generation shortfalls. Congress provided section 202(c) as the primary mechanism to ensure that when generation is needed to meet an emergency, environmental protections will not prevent a source from meeting that need. To date, section 202(c) has worked well…[50]

DOE has used its authority under Section 202(c) to ensure that a generating unit remain in operation – despite its owner's intention to retire it rather than to take other steps to comply with air pollution standards – to maintain local reliability

[48] 89 Fed. Reg. 38,508, 38,526 (May 7, 2024).

[49] *Id.* ("Facilities may also obtain, if warranted, an emergency order from the Department of Energy pursuant to section 202(c) of the Federal Power Act (16 U.S.C. 824a(c)) that would allow the facility to temporarily operate notwithstanding environmental limits when the Secretary of Energy determines doing so is necessary to address a shortage of electric energy or other electric reliability emergency.").

[50] 89 Fed. Reg. 39,798, 39,915 (May 9, 2024).

until such time as other actions can be in place to mitigate the reliability concern.[51]

35. The 2024 MATS Rule affects only a small portion of the electric system, and at that, sets compliance dates that begin no sooner than 2027.[52] As previously mentioned in paragraph 23, 98% of U.S. generating capacity is not affected by the new fPM and mercury limits of the 2024 MATS Rule at all.

36. Because applying pollution controls to affected EGUs may change their cost of producing power, however, grid operators that follow their normal

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[51] *See* DOE, Federal Power Act section 202(c) - Mirant Corporation August 2005 (May 1, 2012), https://www.energy.gov/oe/articles/federal-power-act-section-202c-mirant-corporation-august-2005 ("On August 24, 2005 in response to a decision by Mirant Corporation to cease generation of electricity at its Potomac River generating station, the District of Columbia Public Service Commission requested that the Secretary of Energy issue a 202(c) emergency order requiring the operation of the Potomac River generating station in order to ensure compliance with reliability standards for the central D.C. area. After investigation, the Secretary made a determination that without the operation of the Potomac River generating station there was a reasonable possibility an outage would occur that would cause a blackout in the central D.C. area. Therefore, on December 20, 2005, a 202(c) emergency order was issued requiring Mirant to operate the Potomac River generating station. The expiration date on that order was October 1, 2006, but it was extended until February 1, 2007. On January 31, 2007, a new 202(c) emergency order was issued to Mirant with substantially the same terms as the earlier order. That order expired July 1, 2007, pursuant to its terms."); DOE Office of Electricity, Docket-EO-05-01: Documents Concerning the 2005-2007 Emergency Reliability Orders Concerning the Potomac River Generating Station under Section 202(c) of the Federal Power Act, https://www.energy.gov/oe/docket-eo-05-01-documents-concerning-2005-2007-emergency-reliability-orders-concerning-potomac ("DOE's December 20, 2005 Order No. 202-05-03 concerning the operation of the Mirant power plant in Alexandria, VA expired on July 1, 2007, as there is no need for any extension of it since Pepco completed and made operational its two new 230kV lines into downtown Washington, DC on June 29, 2007.").

[52] 89 Fed. Reg. 38,508, 38,526 (May 7, 2024) ("The EPA disagrees that this rule would threaten resource adequacy or otherwise degrade electric system reliability. Commenters provided no credible information supporting the argument that this final rule would result in a significant number of retirements or a larger amount of capacity needing controls. The Agency estimates that this rule will require additional fPM control at less than 12 GW of operable capacity in 2028, which is about 11 percent of the total coal-fired EGU capacity projected to operate in that year. The units requiring additional fPM controls are projected to generate less than 1.5 percent of total generation in 2028. Moreover, the EPA does not project that any EGUs will retire in response to the standards promulgated in this final rule. Because the EPA projects no incremental changes in existing operational capacity to occur in response to the final rule, the EPA does not anticipate this rule will have any implications for resource adequacy.").

economic-merit-order dispatch protocols may change the order in which those EGUs will be called upon to generate as an incidental effect. As noted above, dispatch changes occur all of the time based on many factors, such as: the price or availability of fuel (e.g., the availability of a fossil fuel, or the availability of wind or solar output); the addition or subtraction of other generating units; the addition of a new transmission line (or an outage of a line in a storm); or even change in demand (e.g., over the course of a day or season of the year).

37. The fossil generating units affected by the EPA Rule are not necessarily any more "reliable" than replacement technologies. The term "reliable" is often misused in this regard. Different generating technologies are neither reliable nor unreliable, but rather provide different services to the electric system. Some plants – e.g., wind, solar, batteries, gas units – are quick to start up or change their output up and down; this is not the case for many coal-fired steam units. While all generating units have planned and unplanned ("forced") outages, coal-fired units have been experiencing deteriorating forced outage rates (in 2023, their average forced outage rate was nearly 12%, compared to 8% in 2014) and with units with capacity factors below 60% experiencing higher increases in outages.[53] Thus, assertions about the inherent "reliability value" of some generating technologies versus inherent "unreliable character" of others are misplaced.

VI. THE 2024 MATS RULE WILL NOT IMPACT THE GRID IN THE NEAR TERM

38. Electric system reliability will not be adversely harmed, and certainly not in the next two years, in the absence of a stay. The 2024 MATS Rule will not lead to near-term interruptions in the supply of electricity to consumers. The

[53] NERC, "State of Reliability Report" at 8-9 (June 2024), https://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/NERC_SOR_2024_Overview.pdf.

earliest compliance date for EPA's standards is July 2027. Even if an operator intends to retire a unit rather than meet the standards, the unit need not retire before then.

39. Whatever reliability issues exist at present in various parts of the country have not arisen from the rule and must be (and unquestionably are being) addressed by responsible entities whether or not the rule remains in effect during this litigation.

40. No plants will retire in the near term as a result of the 2024 MATS Rule. Even if, hypothetically, a power plant owner were to decide to retire an affected EGU rather than comply by July 2027, a commitment to retire is not the same thing as an actual retirement and the unit need not go off line before that date. And if the owners of certain EGUs believe their retirement would be "premature," they are unlikely to close their plants before the compliance deadline.

41. The North Dakota Study is not a *reliability* analysis (e.g., examining load flows on the system, or resource adequacy considerations), but rather relies on a production-cost analysis to determine the dispatch of the system assuming that different power plants would or would not be available to generate electricity in the future. It estimates whether there would be any periods of "unserved energy" and equates them to "rolling blackouts." The study, however, does not provide a reasonable indication of any actual blackouts on the grid, and in the real world, hours of "unserved energy" can be filled through a variety of means. Experience shows that if a proposed near-term retirement of any of the EGUs assumed to retire in the near term in that study would actually trigger violations of reliability standards (or lead to actual blackouts), then such outcomes would be avoided by other actions (examples of such actions include calls for energy conservation, reconfigurations of transmission equipment, and decisions of the DOE or the grid operator to prohibit any retirement from occurring until such reliability violations

would be mitigated). Damage estimates in the North Dakota Study which reflected the "costs of unserved energy" are unreasonable for indicating the effects of actual blackouts.

VII. THE CONTINUED PATTERN OF RETIREMENTS OF COAL-FIRED UNITS IN THE PAST TWO DECADES HAS BEEN PRIMARILY DRIVEN BY FUNDAMENTAL ENERGY-MARKET ECONOMICS AND IT IS NOT REASONABLE TO CONCLUDE THAT COAL-FIRED EGUs WOULD CONTINUE TO OPERATE INDEFINITELY IN THE ABSENCE OF THE 2024 MATS RULE

42. The continued pattern of retirements of coal-fired power plants in the past two decades has been driven primarily by fundamental energy-market conditions (e.g., competition for low-cost gas-fired and renewable generation) rather than the prior MATS rule. It is unreasonable to conclude that the 2024 MATS Rule will be the leading trigger for coal-plant retirements or that aging coal-fired units would otherwise continue to operate indefinitely in the absence of the new rule.

43. For example, the average coal-fired power plant located in North Dakota will be 47 years old in 2027 and will require continued maintenance costs to remain in good working condition beyond then. The expectation of continued entry of new renewable generating capacity and continued competition from low-cost gas-fired generation will put economic pressure on operations at such units. Accordingly, it would be surprising at best to suggest that any retirements of such units are either "premature" or driven by the 2024 MATS Rule.

44. North Dakota's in-state generation greatly exceeds its in-state demand as of 2023.[54] While North Dakota's net electricity exports have remained relatively

[54] Calculations in this paragraph based on North Dakota data from EIA, Historical State Data,

flat for most of the past decade, the underlying sources of electricity in the state have shifted: Since 2014, when 75% of North Dakota's power generation came from coal-fired power plants, that share has dropped steadily over the past decade and stood at 55% as of the end of 2023. During the same period, the combined amount of in-state wind and gas-fired generation increased from 18% to 41% and greatly contribute to satisfying in-state demand with in-state generation.

45. It is incorrect to assert that EPA has a record of understating the effect of its rules on the power grid by (a) pointing out that in the lead-up to the EPA's prior MATS rule (published in 2012), the agency estimated that that rule would lead to 5 GW of coal-plant retirements, and (b) positing that the rule actually caused nearly 60 GW to retire. Although approximately 60 GW of coal-fired generating capacity did retire between 2002 and 2016, approximately 24 GW of that had retired *by 2012*, and another 10 GW retired in 2013 and 2014 (prior to the compliance deadlines in the 2012 MATS rule). Although 25 GW of coal capacity retired in 2015 and 2016 (the compliance period for the 2012 MATS Rule), even more capacity (76 GW) retired since then, with most of these retirements driven by fundamental market economics making continued operations of coal plants unprofitable. EPA's base case in the 2012 MATS rulemaking had indicated that there would be continued retirements of coal plants even without the rule in place, and that the rule would lead to a net increase of 5 GW of coal-plant retirements

EIA-923 Power Plant Operations Report (Net Generation by State by Producer by Energy Source) and EIA-861 Annual Electric Power Industry Report (Annual Sales to Ultimate Customers by State and Sector), https://www.eia.gov/electricity/data/state/, with additional data for 2023 based on EIA Electric Power Monthly, February 2024 (showing full-year data ("December YTD" [year to date] for 2023) https://www.eia.gov/electricity/monthly/.

from this baseline.[55] Scholarly research points to the competition from low-cost energy alternatives (e.g., driven by the price of natural gas relative to coal for power production[56]) and flat demand for electricity[57] as the largest factors in coal-plant retirements and coal production during the compliance period for the prior MATS rule.

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[55] EPA, "Regulatory Impact Analysis for the Final Mercury and Air Toxics Standard," EPA-452/R-11-011 at 3-19 (Dec. 2011), https://19january2017snapshot.epa.gov/sites/production/files/2015-11/documents/matsriafinal.pdf.

[56] John Coglianese, Todd Gerarden & James Stock, "The Effects of Fuel Prices, Environmental Regulations, and Other Factors on U.S. Coal Production, 2008-2026," Energy Journal 41:1 at 55-82 (2020), https://www.iaee.org/en/publications/init2.aspx?id=0 ("We decompose the decline in coal production from 2008 to 2016 [during which period the electric sector consumed 86% of U.S. coal production] into the contributions of several sources. In particular, we estimate the effects of declining natural gas prices and the introduction of new environmental regulations along with several other factors, using both monthly state-level data and annual information on coal plant closings. We estimate that the declining price of natural gas relative to coal is responsible for 92 percent of the total decline in coal production over this period and that environmental regulations account for an additional six percent, with other factors making small and offsetting contributions."). *See also* EIA, Coal Data Browser, https://www.eia.gov/coal/data/browser/ (showing data on U.S. coal production, shipments to the electric sector, and aggregate coal mine production).

[57] Joshua Linn & Kristen McCormack, "The Roles of Energy Markets and Environmental Regulation in Reducing Coal-Fired Plant Profits and Electricity Sector Emissions," RFF Report (Oct. 2017), https://media.rff.org/documents/RFF20Rpt-NOx20Costs.pdf (later published in the *Rand Journal of Economics* (Sept. 12, 2019), https://onlinelibrary.wiley.com/doi/10.1111/1756-2171.12294) ("We consider three market shocks: natural gas prices, renewables generation, and electricity consumption. Largely because of the rise of production from shale formations, natural gas prices were 30 percent lower in 2015 than projections of 2015 gas prices that were made in 2005. Improved wind generator performance and subsidies caused wind generation in 2015 to be 10 times higher than had been expected. Because of the 2008–9 economic recession and other factors, 2015 electricity consumption was 20 percent below 2005 expectations...The three shocks collectively reduced regulatory costs [related to the MATS rule] from $2.9 billion to $0.4 billion per year (86 percent) and reduced coalfired plant profits by 89 percent…. These shocks explain nearly all of the coal-fired plant retirements observed between 2005 and 2015.").

I declare that the foregoing is true and correct,

Susan F. Tierney

Executed on July 18, 2024

ATTACHMENT 1

ATTACHMENT 1
List of Authored or Co-Authored Reports, Testimony and Regulatory Statements Relevant to This Declaration

Bradley, Michael J., Susan Tierney, Christopher Van Atten, Paul Hibbard, Amlan Saha, and Carrie Jenks, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability," August 2010, https://www.npcc.org/content/docs/public/program-areas/rapa/government-regulatory-affairs/2010/mjbaandanalysisgroupreliabilityreportaugust2010.pdf;

Bradley, Michael J., Susan Tierney, Christopher Van Atten, and Amlan Saha, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability: Summer 2011 Update," June 2011, https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/oira_2060/2060_06132011-2.pdf;

Bradley, Michael J., Susan Tierney, Christopher Van Atten, and Amlan Saha, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability: Fall 2011 Update," November 2011, https://grist.org/wp-content/uploads/2011/11/reliabilityupdatenovember202011.pdf.

Bradley, Michael J., Susan Tierney, Christopher Van Atten, and Amlan Saha, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability: Fall 2011 Update," November 2011, https://grist.org/wp-content/uploads/2011/11/reliabilityupdatenovember202011.pdf.

Hibbard, Paul, Pavel Darling and Susan Tierney, "Potomac River Generating Station: Update on Reliability and Environmental Considerations," Analysis Group, July 19, 2011, https://www.cleanskies.org/wp-content/uploads/2011/07/PRGSReportAnalysisGroup2011.pdf.

Hibbard, Paul, Susan Tierney and Katherine Franklin, "Electricity Markets, Reliability and the Evolving U.S. Power System," June 2017, https://hepg.hks.harvard.edu/sites/hwpi.harvard.edu/files/hepg/files/ag_markets_reliability_final_june_2017.pdf?m=1528140903.

Hibbard, Paul, Susan Tierney and Daniel Stuart, "Electric Utilities and the IIJA/IRA: Ensuring Maximum Benefits for Consumers from New Federal Funding Opportunities," Analysis Group, January 2024, https://www.analysisgroup.com/globalassets/insights/publishing/2024-electric-utilities-and-the-ira-iija.pdf.

National Academies of Sciences, Engineering and Medicine, "The Future of Electric Power in the United States," 2021, https://nap.nationalacademies.org/download/25968.

National Academies of Sciences, Engineering and Medicine, "Enhancing the Resilience of the Nation's Electricity System," 2017, https://doi.org/10.17226/24836.

National Academies of Sciences, Engineering and Medicine, "Accelerating the Decarbonization of the U.S. Energy System," 2021, 2023, https://nap.nationalacademies.org/catalog/25932/accelerating-decarbonization-of-the-us-energy-system.

Susan Tierney, "U.S. Coal-Fired Power Generation: Market Fundamentals as of 2023 and Transitions Ahead," August 9, 2023, https://www.analysisgroup.com/globalassets/insights/publishing/2023-tierney-coal-generation-report.pdf.

Tierney, Susan, Statement Before the Federal Energy Regulatory Commission, Technical Conference on Environmental Regulations and Electric Reliability, Wholesale Electricity Markets, and Energy Infrastructure, Docket No. AD15-4-000, February 19, 2015.

Tierney, Susan, Testimony Before the Senate Budget Committee, Hearing on "Beyond the Breaking Point: The Fiscal Consequences of Climate Change on Infrastructure," July 26, 2023.

Tierney, Susan, "Testimony Before the House Committee on Science, Space and Technology, hearing on "Lessons learned from the Texas blackouts: Research needs for a secure and resilient grid," March 18, 2021.

Tierney, Susan, Testimony Before the Senate Energy and Natural Resources Committee, at hearing on the electric industry in a changing climate, oral and written testimony, March 5, 2019.

Tierney, Susan, Testimony before the House Committee on Energy and Commerce, Subcommittee on Energy, Hearing on "Powering America: Defining Reliability in a Transforming Electricity Industry, October 3, 2017 (testimony dated September 12, 2017)

Tierney, Susan, Declaration on electric system reliability, Attachment 9 to the Opposition of Environmental and Public Health Respondent-Intervenors to Petitioners' Stay Motions, filed June 11, 2024, in *State of West Virginia, et al., v. EPA*, U.S. Court of Appeals for the District of Columbia Circuit, No. 24-1120, June 11, 2024, re: 89 Fed. Reg. 39,798 (May 9, 2024).

Tierney, Susan, "Greenhouse Gas Emission Reductions From Existing Power Plants Under Section 111(d) of the Clean Air Act: Options to Ensure Electric System Reliability," May 8, 2014, attached to Tierney Testimony Before the U.S. House of Representatives, Committee on Oversight & Government Reform, Hearing to Examine the Impacts of EPA Air and Water Regulation on the States and the American People, February 26, 2015, https://oversight.house.gov/wp-content/uploads/2015/02/Tierney-Testimony-House-Interior-Subcommittee-2-26-2015.docx.pdf.

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Tierney, Susan, "Prepared Statement of Susan F. Tierney," FERC Reliability Technical Conference, Docket No. AD23-9-000, November 9, 2023, https://www.ferc.gov/media/susan-tierney-statement.

Tierney, Susan, Paul Hibbard and Craig Aubuchon, "Electric System Reliability and the EPA's Clean Power Plan: Tools and Practices," February 2015, https://hepg.hks.harvard.edu/sites/hwpi.harvard.edu/files/hepg/files/electric_system_reliability_and_epas_clean_power_plan_0215.pdf?m=1529956845.

ATTACHMENT 2

ANALYSIS GROUP

Electric System Reliability and EPA Regulation of GHG Emissions from Power Plants: 2023

Author:
Susan Tierney

November 7, 2023

Acknowledgments

This is an independent study prepared by the author at the request of Environmental Defense Fund. The Report, however, reflects the analysis and judgment of the author alone.

About the Author

Sue Tierney is a Senior Advisor at Analysis Group, where she has advised a wide variety of organizations. Previously, she served as the Assistant Secretary for Policy at the U.S. Department of Energy, and in Massachusetts she was Secretary of Environmental Affairs, Commissioner at the Department of Public Utilities, and Executive Director of the Energy Facilities Siting Council. She chairs the Board of Resources for the Future. She is a trustee of the Barr Foundation and the Alfred P. Sloan Foundation, a board member at World Resources Institute, and chairs the National Academies' Board on Environmental and Energy Systems. She has served on several National Academies' committees: The Future of the Electric Grid; Net Metering in the Evolving Electricity System; and Accelerating Decarbonization in the U.S. She chaired the Department of Energy's Electricity Advisory Committee, and now chairs the External Advisory Council of the National Renewable Energy Lab. She received her Ph.D. in regional planning from Cornell University

About Analysis Group

Analysis Group is one of the largest economics consulting firms, with over 1,200 professionals across 14 offices in North America, Europe, and Asia. Since 1981, Analysis Group has provided expertise in economics, finance, analytics, strategy, and policy analysis to top law firms, Fortune Global 500 companies, government agencies, and other clients. The firm's energy and climate practice area is distinguished by its expertise in economics, finance, market modeling and analysis, economic and environmental regulation, analysis and policy, and infrastructure development. Analysis Group's consultants have worked for a wide variety of clients, including energy suppliers, energy consumers, utilities, regulatory commissions, other federal and state agencies, tribal governments, power system operators, foundations, financial institutions, start-up companies, and others.

Table of Contents

I. Executive Summary

This report is the latest in a long series of papers, comments and testimony that I have written over the past dozen years on the importance of maintaining electric system reliability as part of the development and implementation of federal regulations addressing air pollution from power plants. This report focuses on the Environmental Protection Agency's newest proposal to regulate greenhouse gas emissions from existing and new fossil generating units under Section 111 of the Clean Air Act.

A common theme in prior instances where EPA issued proposals to control power plant emissions is that industry stakeholders raise concerns that the proposal, if adopted by EPA, would jeopardize electric system reliability and thus conflict with the industry's obligation to provide around-the-clock electricity supply to consumers. Such red flags were raised in 2010 and 2011 about EPA's regulations to control mercury emissions, other hazardous air pollutants and the interstate transport of air pollution. Concerns were raised in the 2013-2015 period when EPA proposed regulations to control emissions of greenhouse gases from fossil-fueled power plants.

In each of those contexts, I authored or co-authored reports and provided testimony and commentary that acknowledged the critical importance of electric system reliability and described the various tools available to the industry to ensure the reliable supply of power even as owners of fossil-fueled generating units were required to take steps to reduce their emissions.[1] Some of these tools were written into the design of EPA's proposals themselves, because in each instance, EPA took into consideration the need to keep the lights on even as power plants complied with new regulations. Other tools are standard elements of the reliability tool kits long available to players in the electric industry.

In every instance in the past dozen years, the industry predictably stepped up to ensure that reliability was not compromised – mainly because these many tools are available and because power plant owners, reliability organizations, regulators, other public officials, and a wide range of other stakeholders took myriad actions to ensure that the grid as a whole performed its essential public service functions.

A common theme in past EPA efforts to control air pollution from existing power plants is concern that implementation of new rules will harm electric system reliability.

Yet past implementation of such power-plant emissions regulations has not led to such outcomes, in large part due to the existence and use of various tools to ensure reliable operations of the system.

In fact, in spite of early industry concerns that EPA's 2015 Clean Power Plan would introduce reliability problems if it went into effect (which it never did, after its implementation was stayed by the court and replaced by EPA in 2019), power-sector carbon dioxide emissions dropped to 34 percent below 2005 levels (thus exceeding the Clean

[1] These writings are referenced with citations in the body of this report.

Power Plan's goal of reducing such emissions by 32 percent by 2030).[2] There is no indication that such emission reductions have led to reliability events (although there is clear indication that extreme weather related to climate change has exacerbated them).

Reduction of power-sector carbon-dioxide emissions is the result of many changes in the electric industry over the past decade. The portfolio of generating resources has transitioned, with retirements of significant coal-fired generating capacity, with gas-fired power plants now providing the largest share of electricity supply and with wind and solar energy making up increasing percentages of electricity generation.[3] Electricity demand – in terms of year-long use and peak demand – has begun to grow in most parts of the country. Fundamental market forces, federal and state policies, and consumer preferences are principal drivers of such changes.[4] Extreme weather events, including frigid cold, droughts, heat waves, wildfires, torrential downpours, and flooding events, have disrupted energy infrastructure, including on the electricity grid (and notably among fossil generating units and their sources and transmitters of natural gas supply).[5]

Many stakeholders have commented that in light of these circumstances, the EPA's recent proposal errs in a number of ways, especially by not allowing more time for compliance and more expansive safety valves to provide more flexibility in the event that reliability problems arise.[6]

Many stakeholders have raised concerns that EPA's newest proposal to regulate GHG emissions from new and existing power plants could jeopardize reliability. Commenters call for longer compliance periods, greater flexibility in implementation and use of broader reliability safety valves.

The EPA regulation, however, reflects the agency's careful attention to reliability and includes many elements designed to ensure that the nation can enjoy the benefits of reduced aire pollution and operational reliability.

Although some of the particulars of the current context are different from those in the past, there are many reasons to feel reassured that this new EPA rule will not jeopardize electric system reliability.

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[2] Congressional Budget Office, "Emissions of Carbon Dioxide in the Electric Power Sector," December 2022, https://www.cbo.gov/system/files/2022-12/58419-co2-emissions-elec-power.pdf.

[3] National Academies of Sciences, Engineering and Medicine, "The Future of Electric Power in the United States," 2021 (hereafter "NASEM Future of Electric Power"), https://nap.nationalacademies.org/download/25968.

[4] Susan Tierney, "U.S. Coal-Fired Power Generation: Market Fundamentals as of 2023 and Transitions Ahead," August 8, 2023 (Corrected), https://www.analysisgroup.com/globalassets/insights/publishing/2023-tierney-coal-generation-report.pdf.

[5] Susan Tierney, Testimony before the U.S. Senate Committee on the Budget, Hearing on "Beyond the Breaking Point: The Fiscal Consequences of Climate Change on Infrastructure," July 26, 2023 (hereafter "Tierney Budget Committee Testimony 2023"), https://www.budget.senate.gov/imo/media/doc/Hon.%20Susan%20F.%20Tierney%20-%20Testimony%20-%20Senate%20Budget%20Committee.pdf.

[6] *See* for example the following sets of comments submitted to the Environmental Protection Agency in Docket EPA-HQ-OAR-2023-0072: American Public Power Association, Comments, August 9, 2023, https://www.regulations.gov/comment/EPA-HQ-OAR-2023-0072-0566; National Rural Electric Cooperative Association, Comments, August 8, 2023, https://www.electric.coop/wp-content/uploads/2023/08/111-NPRM-Comments-NRECA.pdf; Edison Electric Institute, Comments, August 8, 2023, https://www.eei.org//-/media/Project/EEI/Documents/Resources-and-Media/TFB/EEIComments_111Rules_FINAL_080823.pdf; Power Generators Air Coalition, August 8, 2023 (hereafter "PGen Comments"), https://pgen.org/wp-content/uploads/2023/08/PGen-Comments-on-EPAs-Proposed-GHG-Emission-Standards-and-Guidelines-for-Fossil-Fuel-Fired-EGUs-with-attachments.pdf; Electric Power Supply Association, "Comments", August 5, 2023. https://epsa.org/wp-content/uploads/2023/08/EPSAComments_EPA111_August2023.pdf.

First, the electricity reliability institutions, tools and processes in place today are as good as, if not better than, those in place a decade ago. In addition to its important and continually updated reliability assessments of reliability conditions and outlooks, the North American Electric Reliability Council has instituted new assessments[7] and tools to identify reliability risks and opportunities and to recommend approaches to mitigate them.

Second, significant attention is already being paid by federal and state legislators, reliability organizations, and regulators and other public officials to address confounding circumstances – including gas/electric coordination issues, cybersecurity risks, transitions in generation portfolios, need to enhance the resilience of energy infrastructure to extreme weather events, transmission expansion challenges, wholesale market rule considerations, utility forecasting and planning, equity concerns[8] – so as to assure the grid is fit for purpose in the years ahead.

Third, the EPA proposal to curb GHG emissions from new and existing electric generating units itself includes multiple features to accommodate flexibilities in implementation and compliance-related reliability concerns. These elements of the proposal include: the fact that emissions limits apply only to some subcategories of existing generating units; the long lead times for compliance (with varied deadlines for units with different "operating horizons" and capacity factors); and the ability of states to design implementation plans with a degree of allowance trading and banking; and the commitment of the Department of Energy to use its authorities in a circumstance where compliance at a particular unit might trigger a local reliability concern. There is also the agency's existing system emergency exclusion for reliability.[9]

Unquestionably, there are many other reliability risks that have been identified by NERC, FERC and other organizations.

There is significant work underway to address such risks and needs to continue in earnest, regardless of finalization of the EPA regulation and its eventual implementation in the years ahead.

Unquestionably, the important reliability risks that currently affect the electric industry must be addressed and there is significant work underway to do so.[10] Regardless of requirements that developers of new gas-fired power plants and owners of existing fossil fuel power plants comply with new GHG emission reduction requirements, the electric industry must take the steps necessary to ensure reliability given the many other changes already underway and that are affecting the nation's energy transition.

[7] NERC, "2023 ERO Reliability Risk Priorities Report" (RISC Approved 7-24-2023; NERC Board approved 8-17-2023) (hereafter "NERC Reliability Risk Priorities Report 2023"), https://www.nerc.com/comm/RISC/Related%20Files%20DL/RISC_ERO_Priorities_Report_2023_Board_Approved_Aug_17_2023.pdf.

[8] NASEM Future of Electric Power; NASEM 2023 Decarbonization Study.

[9] https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-60/subpart-TTTT.

[10] NERC Reliability Risk Priorities Report 2023.

II. Background and Introduction

EPA's May 2023 proposal to regulate GHG emissions from existing and new fossil-fueled power plants has prompted thousands of public comments from stakeholders.[11] Among other things, various commenters from the power industry raise concerns about the implications of the proposed rule for electric system reliability, in part due to the potential for premature retirements of existing fossil-fueled electric generating units, operational constraints on some generating units, and difficulties in adding new gas-fired generating units.[12]

Some commenters point to what they view as technical flaws in the EPA's modeling of the industry's response to the proposed regulation, which in their view gives rise to reliability concerns. Other comments relate to market factors and considerations that the commenters view as inconsistent with EPA assumptions.

Comments address a wide variety of issues, only a small portion of which are addressed here in this report. This paper focuses on the following topics:

- Section III contains a high-level overview of the EPA proposal, especially as it intersects with electric-system reliability.
- Section IV provides context for considering the reliability-related comments and industry reactions to EPA's proposed regulations.
- Section V addresses my responses to thematic and technical concerns raised by stakeholders with regard to reliability issues.

[11] As of October 24, 2023, the EPA reports that 8,034 comments have been posted to Docket EPA-HQ-OAR-2023-0072, and that the agency has received a total of 1,293,352 comments on its proposal. https://www.regulations.gov/docket/EPA-HQ-OAR-2023-0072.

[12] *See* for example the following sets of comments submitted to the Environmental Protection Agency in Docket EPA-HQ-OAR-2023-0072: American Public Power Association, Comments, August 9, 2023, https://www.regulations.gov/comment/EPA-HQ-OAR-2023-0072-0566; National Rural Electric Cooperative Association, Comments, August 8, 2023, https://www.electric.coop/wp-content/uploads/2023/08/111-NPRM-Comments-NRECA.pdf: Edison Electric Institute, Comments, August 8, 2023, https://www.eei.org//-/media/Project/EEI/Documents/Resources-and-Media/TFB/EEIComments_111Rules_FINAL_080823.pdf; Comments of the Power Generators Air Coalition on the U.S. EPA New Source Performance Standards for GHG Emissions, Docket No. EPA-HQ-OAR-2023, 0072, August 8, 2023 (hereafter "PGen Comments"), https://pgen.org/wp-content/uploads/2023/08/PGen-Comments-on-EPAs-Proposed-GHG-Emission-Standards-and-Guidelines-for-Fossil-Fuel-Fired-EGUs-with-attachments.pdf; Electric Power Supply Association, "Comments", August 5, 2023. https://epsa.org/wp-content/uploads/2023/08/EPSAComments_EPA111_August2023.pdf.

III. Overview: EPA's Proposed Regulation for GHG Emissions from Fossil Units

On May 23, 2023, the Federal Register published EPA's proposal under Section 111 of the Clean Air Act to establish new source performance standards ("NSPS") for GHG emissions from new fossil-fueled stationary combustion turbine ("CT") electric generating units ("EGUs"), existing coal-fired EGUs, and from large and frequently used existing fossil CTs.[13] (Smaller existing fossil CTs (whether frequently or infrequently used) are not covered by this proposed rule.)

The Federal Register notice (often referred to as the "Preamble") describes the proposal in detail, identifies topics for comment and is accompanied by several other documents including a Regulatory Impact Assessment.[14] EPA's May 2023 proposal anticipates that the agency will publish final emission guidelines in June 2024, with state plans due to the agency 24 months later (e.g., June 2026).[15]

EPA states that it "has designed these proposed standards and emission guidelines in a way that is compatible with the nation's overall need for a reliable supply of affordable electricity" and is "taking into account the cost of the reductions, non-air quality health and environmental impacts, and energy requirements." [16]

More specifically, EPA states that it "has carefully considered the importance of maintaining resource adequacy and grid reliability in developing these proposals and is confident that these proposed NSPS and emission guidelines – with the extensive lead time and compliance flexibilities they provide – can be successfully implemented in a manner that preserves the ability of power companies and grid operators to maintain the reliability of the nation's electric power system."[17]

In addition to its regular interactions with federal agencies involved in matters affecting the electric industry, EPA drafted its proposal after two rounds of broad stakeholder engagement, including a pre-proposal docket that solicited public input prior design of the proposed regulation.[18] EPA's interagency consultations included

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[13] This description of the EPA's proposal draws upon the Preamble published in the Federal Register 33240 Federal Register / Vol. 88, No. 99 at 33240, Tuesday, May 23, 2023, Proposed Rule (for Environmental Protection Agency, 40 CFR Part 60, [EPA–HQ–OAR–2023–0072; FRL–8536–02–OAR], RIN 2060–AV09, New Source Performance Standards for Greenhouse Gas Emissions From New, Modified, and Reconstructed Fossil Fuel-Fired Electric Generating Units; Emission Guidelines for Greenhouse Gas Emissions From Existing Fossil Fuel-Fired Electric Generating Units; and Repeal of the Affordable Clean Energy Rule) (hereafter referred to as the "Preamble"), https://www.govinfo.gov/content/pkg/FR-2023-05-23/pdf/2023-10141.pdf.

[14] See the "browse documents" tab at EPA's website for Docket EPA-HQ-OAR-2023-0072, https://www.regulations.gov/docket/EPA-HQ-OAR-2023-0072/document.

[15] Preamble, at 33372.

[16] Preamble, at 33243.

[17] Preamble, at 33246.

[18] Preamble, at 33276-77. "In the first round of outreach, in early 2022, the EPA sought input in a variety of formats and settings from States, Tribal nations, and a broad range of stakeholders on the state of the power sector and how the Agency's regulatory actions affect those trends. This outreach included State energy and environmental regulators; Tribal air regulators; power companies and trade associations representing investor-owned utilities, rural electric cooperatives, and municipal power agencies; environmental justice and community organizations; and labor, environmental, and public health organizations. A second round of outreach took place in August and September 2022, and focused on seeking input specific to this rulemaking. The EPA asked to hear perspectives, priorities, and feedback around five guiding questions, and encouraged public input to the nonregulatory docket (Docket ID No. EPA–HQ–OAR–2022–0723) on these questions as well."

discussions with the Department of Energy ("DOE") that covered reliability and technology issues among other things. Additionally, EPA described its resource adequacy assessment in a Resource Adequacy Technical Support Document.[19]

The proposed rule addresses emissions from certain types of fossil EGUs: new natural gas CT units (including in simple-cycle and combined-cycle configurations); existing fossil steam units (i.e., coal, natural gas, oil); and certain existing gas CTs.[20] The compliance deadlines vary for different types of units depending upon a number of factors relating to size, technology (i.e., steam unit versus combustion turbine) and operating characteristics (e.g., capacity factor, expected time period during which the unit would continue to remain in service), as explained further below.

In setting deadlines, EPA acknowledged that such factors affect the economics of recovering the costs of control technologies[21] and explained that during the early engagement process, "industry stakeholders requested that the EPA '[p]rovide approaches that allow for the retirement of units as opposed to investments in new control technologies, which could prolong the lives of higher-emitting EGUs; this will achieve maximum and durable environmental benefits.' Industry stakeholders also suggested that the EPA recognize that some units may remain operational for a several-year period but will do so at limited capacity (in part to assure reliability), and then voluntarily cease operations entirely."[22]

The proposed rule includes standards for new stationary CT units (which EPA states are likely to be fueled by natural gas) with facilities having different projected levels of output associated with "base load" operations (defined as units with a capacity factor greater than ~50 percent), "intermediate load" operations (units with a capacity factor of 20-~50 percent) and "low load" operations (units with a capacity factor less than 20 percent)).[23]

Between now and 2032, base load and intermediate units would need to meet emissions levels of highly efficient combined cycle ("CC") and CT technology, respectively. Starting in 2032, intermediate units would need to meet emissions associated co-firing with 30-percent low-GHG hydrogen ("H2"). In 2032 and beyond, base-load units would have standards consistent with two options (which EPA calls "pathways"): (a) a "Low-GHG Hydrogen Pathway" with an emissions standard based on co-firing with 30-percent low-GHG H2 starting in 2032, and with

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[19] See the EPA "TSD – Resource Adequacy," ID EPA-HQ-OAR-2023-0072-0034 (hereafter referred to as the "Resource Adequacy TSD"), at https://www.regulations.gov/docket/EPA-HQ-OAR-2023-0072/document.

[20] "The EPA is not proposing to revise the NSPS for newly constructed or reconstructed fossil fuel-fired steam generating units, which it promulgated in 2015 (80 FR 64510; October 23, 2015). This is because the EPA does not anticipate that any such units will construct or reconstruct and is unaware of plans by any companies to construct or reconstruct a new coal-fired EGU. The EPA is proposing to revise the standards of performance that it promulgated in the same 2015 action for coal-fired steam generators that undertake a large modification (*i.e.,* a modification that increases its hourly emission rate by more than 10 percent) to mirror the emissions guidelines, discussed below, for existing coal-fired steam generators. This will ensure that all existing fossil fuel-fired steam generating sources are subject to the emission controls whether they modify or not." Preamble, at 33245.

[21] Preamble, at 33245.

[22] Preamble, at 33245.

[23] EPA, "Clean Air Act Section 111 Regulation of Greenhouse Gas Emissions form Fossil Fuel-Fired Electric Generating Units," May 11, 2023, https://www.epa.gov/system/files/documents/2023-05/111%20Power%20Plants%20Stakeholder%20Presentation2_4.pdf; EPA, "Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants," Webinar for Communities with Environmental Justice Concerns and Members of Tribal Nations, June 2023, https://www.epa.gov/system/files/documents/2023-06/111%20Power%20Plants%20Stakeholder%20Presentation_Webinar%20June%202023.pdf.

emissions rates consistent with co-firing with 96-percent low-GHG H2 starting in 2038; or (b) a "CCS Pathway" tied to emissions levels of 90 percent carbon capture and storage starting in 2035. These standards are shown in Table 1, along with the timing and character of standards for existing units (explained further below).

Table 1:
EPA Proposed Emissions Guidelines and Standards for Various New and Existing Electric Generating Units

	New (or Modified) Units					Existing Units				
	New Fossil CTs (Likely natural gas units) with compliance starting on in-service date				New, Recon-structed or Modified steam units (Likely coal)	Fossil CTs >300 MW and CF>50%* (Likely gas)	Fossil Steam Units** (coal, gas, oil units)		(coal units)	
	CF <20%	CF 20-50%	CF >~50%				If cease operations by 2032	If cease operations by 2035	If cease operations by 2040	If operate beyond 2040
2024	Final rule (State Implementation Plans due 24 months later)									
2025, 2026 (SIPs due), 2027, 2028, 2029	Use of low-CO_2 fuel	Use of efficient current CT technology	Use of efficient current CC technology		2015 standards remain in place***					
2030, 2031							Routine O&M (no emissions rate increase)	Routine O&M, no emissions rate increase, capacity factor <20%	Co-firing 40% natural gas (with 16% reduction in emissions rate)	CCS with 90% capture of CO_2
2032, 2033, 2034		Add co-firing with 30% low-GHG H2	Co-firing with 30% low-GHG H2	Efficient CC units		Same as New Fossil CCs with CF >50% (with two options)				
2035, 2036, 2037				CCS with 90% capture						
2038, 2039, 2040, 2041+			Co-firing with 96% low-GHG H2							
Acronyms:										

Acronyms:

CC (combined cycle); CCS (carbon capture and storage); CF (capacity factor); GHG (greenhouse gas); CO_2 (carbon dioxide); CT (combustion turbine); H2 (hydrogen); MW (megawatt); O&M (operations and maintenance); SIP (State Implementation Plan)

Notes:

Gray-shaded areas indicate years when such plants will no longer operate due to an enforceable commitment from the unit's owner.

* Existing gas-fired CTs: Smaller (<300MW) with capacity factor below 50% not covered by the current EPA GHG proposal.

** Existing gas or oil-fired boilers: routine O&M with no increase in emissions rate

*** Current standards remain in place until such time as EPA makes a new proposal

https://www.epa.gov/system/files/documents/2023-05/111%20Power%20Plants%20Stakeholder%20Presentation2_4.pdf;
https://www.epa.gov/system/files/documents/202306/111%20Power%20Plants%20Stakeholder%20Presentation_Webinar%20June%202023.pdf.

Large, frequently used existing fossil combustion turbine units would be required to follow those same emissions guidelines after 2032. For modified and reconstructed fossil steam units (which are likely to be coal-fired generating units), existing emissions standards established in 2015 remain in place.

For existing steam and combustion turbine generating units, EPA's Preamble summarizes the compliance deadlines by subcategory of generating units as follows (with emphasis and formatting adjustments added from the original text so as to focus on treatment of different categories of electric generating units):

> In response to this industry stakeholder input and recognizing that the cost effectiveness of controls depends on the unit's expected operating time horizon, which dictates the amortization period for the capital costs of the controls, **the EPA believes it is appropriate to establish subcategories of existing steam EGUs that are based on the operating horizon of the units**.
>
> The EPA is proposing that for **[existing steam] units that expect to operate in the long-term** (*i.e.,* those that plan to operate past December 31, 2039), the BSER [Best System of Emissions Reduction] is the use of CCS [carbon capture and storage] with 90 percent capture of CO_2 with an associated degree of emission limitation of an 88.4 percent reduction in emission rate (lb CO_2/MWh-gross basis). As explained in detail in this proposal, CCS with 90 percent capture of CO_2 is adequately demonstrated, cost reasonable, and achieves substantial emissions reductions from these units.
>
> The EPA is proposing to define **coal-fired steam generating units with medium-term operating horizons** as those that (1) Operate after December 31, 2031, (2) have elected to commit to permanently cease operations before January 1, 2040, (3) elect to make that commitment federally enforceable and continuing by including it in the State plan, and (4) do not meet the definition of near-term operating horizon units. **For these medium-term operating horizon units**, the EPA is proposing that the BSER is co-firing 40 percent natural gas on a heat input basis with an associated degree of emission limitation of a 16 percent reduction in emission rate (lb CO2/MWh-gross basis)….
>
> For **[existing fossil steam] units with operating horizons that are imminent-term**, *i.e.,* those that (1) Have elected to commit to permanently cease operations before January 1, 2032, and (2) elect to make that commitment federally enforceable and continuing by including it in the State plan, the EPA is proposing that the BSER is routine methods of operation and maintenance with an associated degree of emission limitation of no increase in emission rate (lb CO2/MWh-gross basis). The EPA is proposing the same BSER determination for units in the near-term operating horizon subcategory, *i.e.,* units that (1) Have elected to commit to permanently cease operations by December 31, 2034, as well as to adopt an annual capacity factor limit of 20 percent, and (2) elect to make both of these conditions federally enforceable by including them in the State plan.….
>
> The EPA is also proposing emission guidelines for **existing natural gas-fired and oil-fired steam generating units**. Recognizing that virtually all of these units have

> limited operation, the EPA is, in general, proposing that the BSER is routine methods of operation and maintenance with an associated degree of emission limitation of no increase in emission rate….[24]

Under Section 111(d) and its application to existing electric generating units, states must submit plans to EPA that provide for the establishment, implementation and enforcement of standards of performance for existing sources, with those state-specific standards being at least as stringent as EPA's final guidelines. States may take into account remaining useful life and other factors when applying standards of performance to individual existing sources. EPA is proposing that states submit their State Implementation Plans ("SIPs") within 24 months after EPA finalizes the new rule.

EPA's Preamble explains the agency's approach to considering the implications of the proposed rule for the ability of the grid to maintain resource adequacy and electric system reliability:[25]

> Finally, the EPA has carefully considered the importance of maintaining resource adequacy and grid reliability in developing these proposals and is confident that these proposed NSPS and emission guidelines – with the extensive lead time and compliance flexibilities they provide – can be successfully implemented in a manner that preserves the ability of power companies and grid operators to maintain the reliability of the nation's electric power system. The EPA has evaluated the reliability implications of the proposal in the *Resource Adequacy Analysis* TSD; conducted dispatch modeling of the proposed NSPS and proposed emission guidelines in a manner that takes into account resource adequacy needs; and consulted with the DOE and the Federal Energy Regulatory Commission (FERC) in the development of these proposals. Moreover, the EPA has included in these proposals the flexibility that power companies and grid operators need to plan for achieving feasible and necessary reductions of GHGs from these sources consistent with the EPA's statutory charge while ensuring grid reliability….[26]

EPA concluded that its proposed emissions standards for existing gas-fired and coal units and new gas-fired units would have "very little incremental impact on resource adequacy" relative to the agency's modeled baseline (without the proposed standards in place). EPA estimated, for example, that "the emission guidelines for existing gas would cover 36.8 GW of natural gas EGUs, which represents 7.7 percent of total natural gas capacity in 2035"

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[24] Preamble, at 33245-46.

[25] EPA states in the Resource Adequacy Technical Support Document: "As used here, the term resource adequacy is defined as the provision of adequate generating resources to meet projected load and generating reserve requirements in each power region, while reliability includes the ability to deliver the resources to the loads, such that the overall power grid remains stable. This document is meant to serve as a resource adequacy assessment of the impacts of the final rule and how projected outcomes under the final rule compare with projected baseline outcomes in the presence of the [Inflation Reduction Act]." Resource Adequacy TSD, page 2.

[26] Preamble, at 33246.

and with "only a fraction of this amount ha[ving] a direct effect on resource adequacy" (i.e., meeting peak demand).[27]

The many provisions within EPA's proposed rule that also together address assurance of electric system resource adequacy and operational reliability include a combination of proposal elements and process attributes that provide many ways to address reliability concerns (i.e., at least a decade and in many cases longer to mitigate concerns). These elements include:

- Periods of governmental and stakeholder engagement prior to the 2023 Federal Register notice of the proposal, with discussions of potential interactions of the proposal and electric system reliability.

- Two-year lead times after EPA finalizes the rule in which states prepare their SIPs and identify potential ways (including through emissions averaging and trading) to provide compliance flexibility for affected generating units.

- Various time frames during which existing coal-fired generating units come into compliance with the emissions standards, depending on their operating horizons and output levels.

    - Coal units that commit to close by 2032 have no operating standards applied to them (except for routine operations and maintenance ("O&M")). This is nearly 10 years after notice of the proposed rule, and 8 years after the expected final rule.
    - Coal units that commit to close by 2034 and have low capacity factors (below 20 percent) have no operating standards applicable to them except for continued routine O&M. This is a decade after the expected year in which EPA finalizes the rule.
    - Coal units with longer anticipated retirement dates beyond 2034 have options for complying with the proposed standards – including through co-firing with natural gas and through eventually adding carbon capture and storage.

- Various options for gas-fired combustion turbines to comply:

    - New low load units (less than 20-percent capacity factor) are subject to standards equivalent to use of lower emitting fuels.
    - In the initial phase of compliance, new intermediate (20 to ~50 percent capacity factor) and baseload units (over ~50 percent capacity factor) are subject to GHG emissions rates tied to the most efficient CT and CC technologies, respectively, that are currently available (something that is likely to be efficient from an investor's point of view in any event).

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[27] Resource Adequacy TSD, page 7. Further, EPA explained: "The total available capacity is needed, at most, for only a fraction of the year [i.e., to meet peak demand]; most facilities can run at significantly less than full utilization throughout the year without any impact on resource adequacy or system reliability. Moreover, even those EGUs [electric generating units] that operate at 50% annual capacity factor or below, and therefore avoid any requirements under the proposed emission guidelines for existing gas, could operate at higher utilization during periods of system need without exceeding a 50% capacity factor on an annual basis. Grid planners and system operators assign high capacity accreditation values to natural gas-fired EGUs that operate at a wide range of capacity factors. Therefore, those EGUs that choose to reduce utilization to at or under 50% would receive full capacity accreditation."

- In later years, new intermediate units are subject to lower GHG emissions standards equivalent to co-firing with low-GHG-emitting hydrogen, while new baseload units are subject to standards equivalent to co-firing low-GHG hydrogen *or* use of carbon capture and storage technology.
- Existing units that are relatively large (over 300 MW) and that operate frequently (over 50-percent capacity factor) meeting similar emissions standards as new baseload units during those same post-2032 time periods.
- Existing gas-fired combustion turbines (operating as stand-alone peaking units or in combined cycle configurations) that are either smaller (which would cover most units[28]) or operate at less than 50 percent capacity factor are not covered by these proposed rules.

[28] According to the Energy Information Administration ("EIA"), most CT generating units that are in operation as of August 2023 and owned by an electric utility or an independent power product are less than 300 MW in size:

- There are approximately 1,750 gas-fired combustion turbine generating units. Only two of these units are above 300 MW in size (nameplate capacity). The total nameplate capacity of all of these units is 143,074 MW (with summer capacity rating of 120,420 MW). The average size is 81 MW (nameplate capacity), or 67 MW summer capacity rating.
- There are an additional 1540 gas-fired combined cycle generating units, of which 181 units are over 300 MW in size (nameplate capacity). The total nameplate capacity of all of these units is 291,340 MW (with summer capacity rating of 263,460 MW). The average size is 189 MW (nameplate capacity), or 171 MW summary capacity rating.

EIA, Preliminary Monthly Electric Generator Inventory, EIA 860M data for August 2023, https://www.eia.gov/electricity/data/eia860m/.

IV. Context: Reliability Concerns Raised in Prior EPA Regulatory Proposals

A predictable complement to an EPA proposal to regulate air pollutants from fossil fueled generating units is a call from various stakeholders to ensure that the new regulation would not jeopardize electric system reliability – something often accompanied by requests to modify and/or delay the proposed regulation.

This has happened on numerous occasions over the past dozen years, I have been involved in assessing reliability concerns in these instances, an experience that – along with my continued participation in a variety of fora involved with electric industry transitions – has given me a perspective on how to think about the concerns currently being raised about EPA's May 2023 proposal to regulate GHG emissions from fossil units.

Here are examples of those prior instances.

- In the early 2010s,[29] EPA published its draft Clean Air Interstate Rule ("CAIR"), which would regulate NO_x and SO_2 emissions in dozens of Eastern states and go into effect at the start of 2012. This rule was eventually replaced by the Cross-State Air Pollution Rule ("CSAPR"), issued by EPA in July 2011 for implementation starting in 2015. During the approximately same period, EPA was developing rules to regulate hazardous air pollutants and mercury emissions from power plants, which also affected emissions from fossil fueled generating units. The latter eventually took the form of the proposed Mercury and Air Toxics Standards (May 2011).[30] EPA proposed new source performance standards for new stationary sources in April 2012.[31]
- At the time, reliability concerns were raised by power plant owners, trade associations, and reliability organizations.
    - I co-authored three reports[32] aimed at assessing the implications of anticipated EPA air-emission regulations for electric-sector reliability, all of which concluded that the electric industry could comply with these EPA regulations without threatening electric system reliability. As I explained in the third of those reports:

        > The first report, published in August 2010, concluded that the electric industry is well-positioned to comply with EPA's proposed air regulations without threatening electric system reliability. The summer 2011 update, published in August,

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[29] https://www.epa.gov/sites/default/files/2016-10/documents/2013_full_report_0.pdf; https://www.epa.gov/Cross-State-Air-Pollution/overview-cross-state-air-pollution-rule-csapr#:~:text=This%20rule%20requires%20certain%20states,soot%20pollution%20in%20downwind%20state.

[30] https://www.epa.gov/mats/epa-proposes-mercury-and-air-toxics-standards-mats-power-plants.

[31] https://www.govinfo.gov/content/pkg/FR-2012-04-13/pdf/2012-7820.pdf.

[32] Michael J. Bradley, Susan Tierney, Christopher Van Atten, Paul Hibbard, Amlan Saha, and Carrie Jenks, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability," August 2010, https://www.npcc.org/content/docs/public/program-areas/rapa/government-regulatory-affairs/2010/mjbaandanalysisgroupreliabilityreportaugust2010.pdf; Michael J. Bradley, Susan Tierney, Christopher Van Atten, and Amlan Saha, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability: Summer 2011 Update," June 2011, https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/oira_2060/2060_06132011-2.pdf; Michael J. Bradley, Susan Tierney, Christopher Van Atten, and Amlan Saha, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability: Fall 2011 Update," November 2011, https://grist.org/wp-content/uploads/2011/11/reliabilityupdatenovember202011.pdf.

> supplemented the original analysis in light of new information and reaffirmed the prior report's major conclusion that the electric industry can comply with EPA's air pollution rules without threatening electric system reliability. The August report noted that proper planning and implementation can secure important public health benefits, reliable electric service, and efficient market outcomes. Th[e] "Fall 2011 Update" focuse[d] on the many tools that are available for ensuring electric reliability as companies comply with the EPA rules by installing modern pollution control systems, utilizing allowances or retiring portions of the fleet that are uneconomic to retrofit. Federal and state regulators agree that the industry has the tools to maintain electric system reliability even in the face of coal plant retirements. In testimony to Congress, FERC Commissioner John Norris stated "[i]n short, based on the information I have reviewed to date on EPA's regulations, I am sufficiently satisfied that the reliability of the electric grid can be adequately maintained as compliance with EPA's regulations is achieved.[33]

- I also wrote a "field guide" to the many industry studies assessing the impacts of EPA regulations on power supply and co-authored a peer review of an electric industry analysis of the potential impacts of environmental regulation on the U.S. generation fleet, and concluded that the report was based on "worst-case assumptions which have not materialized..."[34]

- I testified before the U.S. Senate Environment and Public Works Committee at its June 30, 2011 Oversight Hearing on Review of EPA Regulations Replacing the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR), where I explained the reasons for concluding that the electric "industry will respond innovatively and effectively, and with confidence that Americans can get the benefit of clean air and reliable electricity."[35] *Because most of these reasons are still relevant today, I repeat this summary here:*

> The U.S. electric industry has a proven track record of doing what it takes to provide the nation with reliable electricity. Regulated electric utilities, competitive electric companies, grid operators, and regulators have a strong mission orientation, along

[33] Michael J. Bradley, Susan Tierney, Christopher Van Atten, and Amlan Saha, "Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability: Fall 2011 Update," November 2011, https://grist.org/wp-content/uploads/2011/11/reliabilityupdatenovember202011.pdf.

[34] Susan Tierney May 17, 2011 letter to EPA Administrator Lisa Jackson, with three attachments: (a) S. Tierney and C. Cicchetti, "The Results in Context: A Peer Review of EEI's "Potential Impacts of Environmental Regulation on the U.S. Generation Fleet," May 2011; (b) S. Tierney, "Electric Reliability under New EPA Power Plant Regulations: A Field Guide," January 18, 2011; and (c) S. Tierney, "EPA Regulations, Power Generation Capacity & Reliability," MIT Center for Energy & Environmental Policy Research Workshop – May 5, 2011," https://policyintegrity.org/documents/Tierney_letter_to_EPA_Administrator_Jackson_5-17-2011_-_with_attachments.pdf.

[35] Susan F. Tierney, "Summary of Testimony Before the U.S. Senate Environment and Public Works Committee Subcommittee on Clean Air and Nuclear Safety, June 30, 2011 Oversight Hearing: Review of EPA Regulations Replacing the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule," https://www.epw.senate.gov/public/_cache/files/e/f/ef424b3a-c948-496d-9438-30674d9e25b3/01AFD79733D77F24A71FEF9DAFCCB056.tierneytestimonycombined.pdf.

with regulatory requirements, that together ensure that reliable electricity supply is a priority.

By 2011, it is not reasonable to suggest that EPA's CATR and Utility Toxics Rule are a surprise, or that EPA's proposed regulations will require actions that are technically and economically infeasible. These regulations have been in the works for many years. EPA's proposals allow more flexibility in compliance approaches than previously anticipated.

Many factors besides these new regulations have encouraged owners of coal-fired power plants to take steps to reduce their air emissions. Many states have already adopted regulations as strict as those proposed by EPA. Some companies with facilities affected by the CATR and Utility Toxics rules are already under court orders to achieve similar outcomes even without the new regulations. And many companies have already taken steps to install appropriate control equipment: in recent months, chief executive officers of some of the most affected utility companies in different parts of the country have told their investors that they are already or will be ready to meet the new EPA air regulations. These facts occur within a context in which low natural gas prices are putting pressure on many of the oldest, least-efficient and uncontrolled coal plants to retire for economic reasons.

Much attention has been, and will continue to be, paid to the impacts of the regulations on electric system reliability. Many assessments published in the past year have called attention to potential gaps that could arise in the absence of market, utility and regulators' responses. These studies highlight potential plant retirements under different sets of assumptions, with the more reasonable estimates indicating strongly that the impacts are manageable, as long as industry and its regulators respond in a timely fashion.

The industry has various tools to assure that reliability will not be adversely affected. Among the more important tools are: the strong system-planning processes of utility transmission companies and regional transmission organizations (grid operators); the opportunities for companies to obtain power resources through the wholesale power markets that exist in many of the affected parts of the country; the strong least-cost planning processes that exist for utilities in other affected areas; the interest and ability of developers of new power projects to bring new supplies to the market; the fact that state and federal [regulators] have a strong track record of taking the steps necessary to ensure that the companies they supervise are meeting their obligation to provide reliable electric service; the large reservoirs of untapped cost-effective energy efficiency in affected states that can be mined relatively rapidly and can help ease impacts on consumers' electricity bills; and the statutory tools available to EPA, the Federal Energy Regulatory Commission ("FERC"), the U.S. Department of Energy ("DOE"), and the President to take actions to ensure reliable system conditions when all else fails.

> Finally, recent market developments provide practical, real-world evidence that the EPA clean air regulations are manageable. Notably, the nation's largest competitive wholesale power market – PJM, serving much of the mid-Atlantic and Midwest regions affected by the EPA regulations – has recently conducted its annual auction to purchase capacity so that it will be available far in advance of need. The PJM auction elicited far more capacity offers from existing and new suppliers than is needed for reliability purposes during the period when EPA's new air rules will go into effect."

- During the mid-2010s, EPA was considering approaches to limit GHG emissions and in June 2014 proposed the Clean Power Plan, regulating carbon pollution from existing electric utility fossil generating units. There were myriad concerns raised about the direct impact of such regulations on potential retirements of fossil generating units (especially coal-fired power plants) and apparent consequential reliability concerns for the nation's electric system.

  The North American Electric Reliability Corporation ("NERC"), which is the nation's federally approved Electric Reliability Organization, had previously prepared assessments of the potential impacts of other future environmental regulations (including a November 2011 report on "Potential Impacts of Future Environmental Regulations: Extracted from the 2011 Long-Term Reliability Assessment)".[36] In November 2014, NERC issued its report on "Potential Reliability Impacts of EPA's Proposed Clean Power Plan: Initial Reliability Review."[37] These NERC reports identified retirements of fossil generating units as a major concern, noting the EPA's proposed Clean Power Plan "aims to cut CO_2 emissions from existing power plants to 30 percent below 2005 levels by 2030" and would lead to a major reduction in total generating capacity. NERC expressed its concern that, among other things, "[d]eveloping suitable replacement generation resources to maintain adequate reserve margin levels may represent a significant reliability challenge, given the constrained time period for implementation" and that "Essential Reliability Services may be strained by the proposed CPP."

  During that period, I wrote several papers[38] on reliability considerations related to potential EPA regulation of GHG emissions. Among my observations and conclusions in those reports, I note the following here because they are relevant for consideration of the May 2023 EPA proposal to regulate GHG emissions from fossil generating units:

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[36] This report examined implications of several EPA regulatory activities, including the proposed Coal Combustion Residuals rule, the MATS rule, the Cooling Water Intake Structures rule, and the Cross-State Air Pollution Rule. https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/EPA%20Section.pdf.

[37] https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/Potential_Reliability_Impacts_of_EPA_Proposed_CPP_Final.pdf.

[38] Additionally, I testified before Congress on market and reliability considerations associated with EPA's regulation of GHG emissions from fossil fueled power plants: Testimony of Susan F. Tierney, Ph.D. Before the U.S. House of Representatives Committee on Energy and Commerce, Subcommittee on Energy and Power, "Hearing on EPA's Proposed GHG Standards for New Power Plants and H.R. _, Whitfield-Manchin Legislation November 14, 2013," https://docs.house.gov/meetings/IF/IF03/20131114/101482/HHRG-113-IF03-Wstate-TierneyS-20131114.pdf.

- In 2014, I wrote a white paper on EPA regulation of GHG emissions, with a focus on implications for electric system reliability.

> Historically, the reliability red flag has tended to be raised with regard to concerns that compliance with a new environmental rule would require a large portion of generating capacity to be simultaneously out of service to add control equipment, to retire permanently, or otherwise to become unavailable to produce power. To date, implementation of new environmental rules has not produced reliability problems, in large part because the industry has proven itself capable of responding effectively. A very mission-oriented industry, composed of electric utilities, other grid operators, non-utility energy companies, federal and state regulators, and others, has taken a wide variety of steps to ensure reliability."[39]
>
> Other factors also allow for cost-effective emissions reductions at Section 111(d) units in ways that do not adversely affect system reliability. A significant amount of existing generating capacity is underutilized. For example, output at natural-gas fired combined-cycle power plants averaged approximately 50 percent in 2012. There is the potential to reduce overall demand through energy efficiency, thus reducing the need to dispatch plants with relatively high emission rates. There is potential to add additional low or zero-carbon electricity supply (e.g., wind and solar; combined heat and power; nuclear uprates). Actions also can be taken to extend the life of, or increase the output from, well-performing generating units that produce no emissions at the facility (e.g., hydroelectric resources, nuclear plants).[40]

- In 2015, I participated in a FERC Technical Conference on reliability considerations relating to EPA's proposed Clean Power Plan, and then co-authored a report[41] that summarized and responded to a range of themes raised by other commenters at the series of Technical Conferences hosted by FERC in February and March 2015. Our report observed the following:

> Throughout the FERC CPP Technical Conferences, some participants questioned whether, in light of CPP-driven changes in the resource mix, the grid could continue to perform, especially through high energy demand periods or during unexpected events. These participants generally cited three main factors for these concerns: (1) closure of coal-fired power plants that provide energy, capacity, and

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[39] Susan Tierney, "Greenhouse Gas Emission Reductions From Existing Power Plants: Options to Ensure Electric System Reliability," May 2014, https://www.analysisgroup.com/globalassets/content/insights/publishing/tierney_report_electric_reliability_and_ghg_emissions2.pdf.

[40] Susan Tierney, "Greenhouse Gas Emission Reductions From Existing Power Plants: Options to Ensure Electric System Reliability," May 2014, https://www.analysisgroup.com/globalassets/content/insights/publishing/tierney_report_electric_reliability_and_ghg_emissions2.pdf.

[41] Susan Tierney, Eric Svenson, and Brian Parsons, "Ensuring Electric Grid Reliability Under the Clean Power Plan: Addressing Key Themes from the FERC Technical Conferences," April 2015, https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/2015/04/Ensuring-Electric-Grid-Reliability-Under-the-Clean-Power-Plan.pdf.

essential reliability services such as reactive power, inertia, and voltage control; (2) inadequate infrastructure to support increased demand for natural gas for power generation in various parts of the country, and/or inadequate natural gas supplies; and (3) higher reliance on renewable and demand-side resources.

The evidence does not support the argument that the proposed CPP will result in a general and unavoidable decline in reliability. While we do expect significant changes to the overall mix of resources under the CPP, we believe resource planners and markets will have sufficient time and resources to respond to a realistic projection of system redispatch and facility retirements. Both FERC-jurisdictional electricity markets and state-regulated resource planning processes have provided and will continue to provide timely planning, operational, and financial signals for new resources that can help maintain reliability. With clear and transparent signals, market participants can respond in different time frames and investment cycles for different types of resources, including but not limited to new gas resources, end-use energy efficiency measures and demand response, renewables, electric transmission, and natural gas pipeline infrastructure. We note that several market participants filed comments with EPA indicating their readiness to step up with solutions to these challenges.[42]

- In 2015, I co-authored several reports that addressed electric reliability issues related to the EPA's Clean Power Plan. The initial report focused on tools and practices available to electric industry and its regulators to ensure reliable electric service even as the federal government begins to regulate GHG emissions from power plants.[43] The other reports examined more specific reliability considerations in two regions – the PJM region and the MISO region – with significant existing coal-fired and other fossil generating capacity that would be affected by the CPP.[44]

Since the U.S. Environmental Protection Agency (EPA) proposed its Clean Power Plan last June, many observers have raised concerns that its implementation might jeopardize electric system reliability. Such warnings are common whenever there is major change in the industry, and play an important role in focusing the

[42] Susan Tierney, Eric Svenson, and Brian Parsons, "Ensuring Electric Grid Reliability Under the Clean Power Plan: Addressing Key Themes from the FERC Technical Conferences," April 2015, https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/2015/04/Ensuring-Electric-Grid-Reliability-Under-the-Clean-Power-Plan.pdf.

[43] Susan Tierney, Paul Hibbard and Craig Aubuchon, "Electric System Reliability and the EPA's Clean Power Plan: Tools and Practices," February 2015 (hereafter "Tierney et al Electric Reliability Tools and Practices" and attached to this report as Attachment 1) https://hepg.hks.harvard.edu/sites/hwpi.harvard.edu/files/hepg/files/electric_system_reliability_and_epas_clean_power_plan_0215.pdf?m=1529956845.

[44] Susan Tierney, Paul Hibbard and Craig Aubuchon, "Electric System Reliability and the EPA's Clean Power Plan: The Case of PJM," March 16, 2015, https://www.analysisgroup.com/globalassets/content/insights/publishing/electric_system_reliability_and_epas_clean_power_plan_case_of_pjm2.pdf; and Susan Tierney, Paul Hibbard and Craig Aubuchon, "Electric System Reliability and the EPA's Clean Power Plan: The Case of MISO," June 8, 2015, https://www.analysisgroup.com/globalassets/content/insights/publishing/analysis_group_clean_power_plan_miso_reliability.pdf.

> attention of the industry on taking the steps necessary to ensure reliable electric service to Americans. There are, however, many reasons why carbon pollution at existing power plants can be controlled without adversely affecting electric system reliability.
>
> Given the significant shifts already underway in the electric system, the industry would need to adjust its operational and planning practices to accommodate changes even if EPA had not proposed the Clean Power Plan. In the past several years, dramatic increases in domestic energy production (stemming from the shale gas revolution), shifts in fossil fuel prices, retirements of aged infrastructure, implementation of numerous pollution-control measures, and strong growth in energy efficiency and distributed energy resources, have driven important changes in the power sector. As always, grid operators and utilities are already looking at what adjustments to long-standing planning and operational practices may be needed to stay abreast of, understand, and adapt to such changes in the industry.
>
> The standard reliability practices that the industry and its regulators have used for decades are a strong foundation from which any reliability concerns about the Clean Power Plan will be addressed. The electric industry's many players are keenly organized and strongly oriented toward safe and reliable operations. There are well-established procedures, regulations and enforceable standards in place to ensure reliable operations of the system, day in and day out…..
>
> Some of the reliability concerns raised by stakeholders about the Clean Power Plan presume inflexible implementation, are based on worst-case scenarios, and assume that policy makers, regulators, and market participants will stand on the sidelines until it is too late to act. There is no historical basis for these assumptions. Reliability issues will be solved by the dynamic interplay of actions by regulators, entities responsible for reliability, and market participants with many solutions proceeding in parallel. Some of the cautionary comments are just that: calls for timely action…
>
> In the end, because there are such fundamental shifts already underway in the electric industry, inaction is the real threat to good reliability planning. Again, there are continuously evolving ways to address electric reliability that build off of strong standard operating procedures in the industry.

In the end, there were no reliability problems that arose as a result of EPA's proposed and/or adopted regulation of air emissions from fossil-fueled power plants. This outcome occurred even as other EPA air-pollution rules (e.g., mercury controls, air transport regulations) did go into effect.

In fact, as noted previously, even though the EPA's Clean Power Plan was eventually stayed by federal courts and repealed and replaced by the EPA in 2019,[45] the CPP goal of reducing CO2 emissions from power plants by 32 percent by 2030 was reached by 2020, a decade earlier than planned by the CPP.[46] By that point, transitions in the electric industry (including retirements of significant and relatively inefficient fossil generating capacity, a shift from coal-fired generation to gas-fired power production, and the addition of significant new wind and solar capacity) had taken place more quickly than had been anticipated when the CPP was under consideration.[47]

In many ways, today's context for considering reliability issues related to EPA's new proposal to regulate power plant GHG emissions differs in a number of ways, in other regards the reliability issues, including tools and practices for ensuring reliability, are not so different than they were in the past decade, as described in the following sections of this report.

[45] https://www.epa.gov/stationary-sources-air-pollution/electric-utility-generating-units-repealing-clean-power-plan#:~:text=Additional%20Resources-,Rule%20Summary,the%20Affordable%20Clean%20Energy%20rule.

[46] CBO, "Emissions of Carbon Dioxide in the Electric Power Sector," December 2022, https://www.cbo.gov/system/files/2022-12/58419-co2-emissions-elec-power.pdf.

[47] *See*, for example, EIA, "Analysis of the Impacts of the Clean Power Plan," May 22, 2015, https://www.eia.gov/analysis/requests/powerplants/cleanplan/.

V. Concerns Raised About EPA's 2023 Proposal: Thematic and Technical Issues

A. Overview: Changing conditions in the nation's electric industry

EPA's Preamble describes the changing conditions in the U.S. electric industry, with observations that rely on and cite to many scholarly and expert analyses. As summarized in the Preamble, these power sector changes and trends include: "a prolonged period of transition and structural change. Since the generation of electricity from coal-fired power plants peaked nearly two decades ago, the power sector has changed at a rapid pace. Today, natural gas-fired power plants provide the largest share of net generation, coal-fired power plants provide a significantly smaller share than in the recent past, renewable energy provides a steadily increasing share, and as new technologies enter the marketplace, power producers continue to replace aging assets with more efficient and lower cost alternatives."[48] EPA notes that many owners of existing coal-fired power plants have either already retired them in recent years due to their no longer being economic to operate and maintain, or have announced their intention to retire specific generating units in the future.[49]

The electric-sector trends observed by EPA in detail in the Preamble are consistent with those described in detail in recent National Academies' consensus studies of which I was a co-author: *The Future of Electric Power in the U.S.* (2021),[50] *Accelerating Decarbonization in the U.S* (2021, 2023),[51] and the *Role of Net Metering in the Evolving Energy System* (2023).[52] These trends are also the subject of numerous other governmental, expert and stakeholder groups, including ones related to gas/electric coordination issues,[53] cybersecurity risks,[54] transitions in

[48] Preamble, at 33255, and 33256-33266 and 33415-33416 more generally.

[49] EPA stated that: "Industry stakeholders have requested that the EPA structure this rule to avoid imposing costly control obligations on coal-fired power plants that have announced plans to voluntarily cease operations, and the EPA proposes to accommodate those requests." Preamble, at 33255.

[50] NASEM Future of Electric Power.

[51]; NASEM 2021 Decarbonization Study; NASEM 2023 Decarbonization Study.

[52] National Academies of Sciences, Engineering and Medicine, "The Role of Net Metering in the Evolving Electricity System" (2023) (hereafter "NASEM Net Metering Study"), https://www.nationalacademies.org/our-work/the-role-of-net-metering-in-the-evolving-electricity-system.

[53] FERC, NERC, and Regional Entity Joint Staff Inquiry, "December 2022 Winter Storm Elliott Grid Operations: Key Findings and Recommendations," September 21, 2023, https://www.ferc.gov/news-events/news/presentation-ferc-nerc-regional-entity-joint-inquiry-winter-storm-elliott; FERC, NERC, and Regional Entity Joint Staff Inquiry, "December 2022 Winter Storm Elliott Grid Operations: Key Findings and Recommendations," September 21, 2023, https://www.ferc.gov/news-events/news/presentation-ferc-nerc-regional-entity-joint-inquiry-winter-storm-elliott.

[54] NASEM, Future of Electric Power.

generation portfolios,[55] need to enhance the resilience of energy infrastructure,[56] and transmission expansion challenges.[57]

The Preamble and the Technical Support Document also acknowledge the important influences and roles of other actions and developments – like the increasingly apparent impacts of a changing climate, changes in electricity demand and consumer preferences, the enactment of the 2021 Infrastructure Investment and Jobs Act and the 2022 Inflation Reduction Act, other changes in the cost and performance of electricity generation technologies and fossil fuels, trends in states' adoption of policies affecting the power sector's reliance on different resource portfolios and its emissions of GHGs, and increasing numbers of power companies with commitments to reduce GHG emissions.[58]

Perhaps with the exception of the two new federal statutes[59] which in 2021 and 2022 established extraordinary new levels of financial support and bolstered federal authority for various public and private investment in clean energy technology, these electric-industry changes have been underway for much of the past decade. As such, many of the discussions of reliability concerns and strategies described in the prior section of this report are entirely relevant today.

That said, there are heightened concerns in recent years, in part due to some recent reliability events (e.g., Winter Storm Uri in 2021 and Winter Storm Elliott in 2022[60]) that stressed electric and other energy infrastructure and in some cases produced blackouts or near blackouts with fatal consequences.[61] There is substantial attention to bulk power system reliability being paid by numerous entities, including by NERC which is capably exercising its

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[55] NASEM, Future of Electric Power; National Academies of Sciences, Engineering and Medicine, "Accelerating Decarbonization of the U.S. Energy System" (2021) (hereafter "NASEM 2021 Decarbonization Study") and "Accelerating Decarbonization in the United States: Technology, Policy and Societal Dimensions" (2023) (hereafter "NASEM 2023 Decarbonization Study"), https://www.nationalacademies.org/our-work/accelerating-decarbonization-in-the-united-states-technology-policy-and-societal-dimensions.

[56] *See* for example: U.S. Department of Energy ("DOE"), "National Transmission Needs Study," October 2023, https://www.energy.gov/sites/default/files/2023-10/National_Transmission_Needs_Study_2023.pdf; DOE, "Biden-Harris Administration Announces $13 Billion to Modernize and Expand America's Power Grid," November 18, 2022, https://www.energy.gov/articles/biden-harris-administration-announces-13-billion-modernize-and-expand-americas-power-grid.

[57] *See* for example: Joint Federal-State Task Force on Electric Transmission, https://www.ferc.gov/media/e-1-ad21-15-000; DOE, "Biden-Harris Administration Announces $3.5 Billion for Largest Ever Investment in America's Electric Grid, Deploying More Clean Energy, Lowering Costs, and Creating Union Jobs," October 18, 2023, https://www.energy.gov/articles/biden-harris-administration-announces-35-billion-largest-ever-investment-americas-electric.

[58] Preamble, at 33249-33266.

[59] The Inflation Reduction Act has been called the first and largest climate policy law enacted by Congress. *See* for example: Emma Newburger, "The U.S. passed a historic climate deal this year – here's a recap of what's in the bill," CNBC, December 30, 2022, https://www.cnbc.com/2022/12/30/2022-climate-recap-whats-in-the-historic-inflation-reduction-act.html; Josh Bivens, "The Inflation Reduction Act finally gave the U.S. a real climate change policy," August 14, 2023, https://www.epi.org/blog/the-inflation-reduction-act-finally-gave-the-u-s-a-real-climate-change-policy/.

[60] FERC – NERC – Regional Entity Staff Report, "The February 2021 Cold Weather Outages in Texas and the South Central United States," November 2021, https://www.ferc.gov/media/february-2021-cold-weather-outages-texas-and-south-central-united-states-ferc-nerc-and; FERC, NERC, and Regional Entity Joint Staff Inquiry, "December 2022 Winter Storm Elliott Grid Operations: Key Findings and Recommendations," September 21, 2023, https://www.ferc.gov/news-events/news/presentation-ferc-nerc-regional-entity-joint-inquiry-winter-storm-elliott.

[61] Budget Committee 2023. Tierney Budget Committee Testimony 2023; Testimony of Dr. Melissa Lott of the Columbia University Center on Global Energy Policy before the Senate Committee on Energy and Natural Resources, Hearing on Electric Reliability, June 1, 2023, https://www.energypolicy.columbia.edu/wp-content/uploads/2023/05/Lott-SENR-Testimony-with-appendix-v20230530-1.pdf.

essential role of calling attention to issues related to the adequacy, security and resilience of the power system.

For example, the most recent NERC Long-Term Reliability Assessment (December 2022)[62] identifies "government policies, regulations, consumer factors, and economic factors" as helping to shape transitions in the bulk power system. Prolonged, extreme weather events[63] and "continuing resource mix challenges"[64] are also creating new reliability challenges in recent and in upcoming years. In short: "Energy systems and the electricity grid are undergoing unprecedented change" with the need for relevant actors to take steps to ensure reliability. Such steps include "effective regional transmission and integrated resource planning processes," the adoption of policies and market mechanisms to ensure the capability of the system to maintain "essential reliability services,"[65] transmission investment,[66] "managing the pace of generator retirements until solutions are in place that can continue to meet energy needs and provide essential reliability services,"[67] and mitigating "the risks that arise from growing reliance on just-in-time fuel for electric generation and the interdependent natural gas and electric infrastructure."[68]

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[62] NERC, "Long-Term Reliability Assessment," December 2022 (hereafter "NERC Long-Term Reliability Assessment 2022"), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2022.pdf.

[63] "Electricity supplies can decline in extreme weather for many reasons. Generators that are not designed or prepared for severe cold or heat can be forced off-line in increasing amounts. Wide area weather events can also impact multiple balancing and transmission operations simultaneously that limit the availability of transfers. Fuel production or transportation disruptions could limit the amount of natural gas or other fuels available for electric generation. Wind, solar, and other variable energy resource (VER) generators are dependent on the weather." NERC Long Term Reliability Assessment 2022.

[64] Several such challenges are called out by NERC, including: "reliable interconnection of inverter-based resources," "accommodating large amounts of distributed energy resources," "managing the pace of generation retirements," "maintaining Essential Reliability Services" (e.g., "capability to support voltage, frequency, and dispatchability," as well as reactive support, stability, and ramping/balancing). NERC Long-Term Reliability Assessment 2022.

[65] NERC states that "[v]arious technologies can contribute to essential reliability services, including variable energy resources; however, policies and market mechanisms need to reflect these requirements to ensure these services are provided and maintained. Regional transmission organizations, independent system operators, and FERC have taken steps in this direction, and these positive steps must continue." NERC Long-Term Reliability Assessment 2022.

[66] "There has been some increase in the number of miles of transmission line projects for integrating renewable generation over the next 10 years compared to the 2021 LTRA projections. Transmission investment is important for reliability and resilience as well as the integration of new generation resources." NERC Long-Term Reliability Assessment 2022.

[67] "State and provincial regulators and independent system operators (ISO)/regional transmission operators (RTO) should have mechanisms they can employ to prevent the retirement of generators that they determine are needed for reliability, including the management of energy shortfall risks. • Regulatory and policy-setting organizations should use their full suite of tools to manage the pace of retirements and ensure that replacement infrastructure can be timely developed and placed in service. If needed, the Department of Energy should use its 202(c) authority as called upon by electric system operators. • Resource planners and policymakers must pay careful attention to the pace of change in the resource mix as well as update capacity and energy risk studies (including all-hours probabilistic analysis) with accurate resource projections." NERC Long-Term Reliability Assessment 2022.

[68] "Addressing the Reliability Needs of Interdependent Electricity and Natural Gas Infrastructures. Natural gas is an essential fuel for electricity generation that bridges the reliability needs of the BPS [Bulk Power System] during this period of energy transition. As natural-gas-fired generation continues to increase, vulnerabilities associated with natural gas delivery to generators can potentially result in generator outages. Energy stakeholders must urgently act to solve reliability challenges that arise from interdependent natural gas and electricity infrastructure" including through promoting coordination of these two systems." NERC Long-Term Reliability Assessment 2022.

More recently, NERC published an update report on priority risks that need to be addressed, with identification of "strategic directions" the industry should take to understand, plan for and mitigate such risks.[69] The report highlights "five significant evolving risk profiles":

> **Energy Policy** at the federal, province, state, provincial and local levels is providing incentives and targets for resource changes and end-use applications of electricity. It is further contributing to the **Grid Transformation**, which includes the shift away from conventional synchronous central-station generators toward a new mix of resources that include natural-gas-fired generation; unprecedented proportions of non-synchronous resources, including renewables and energy storage; demand response; smart- and micro-grids; and other emerging technologies which will be more dependent on communications and advanced coordinated controls that can increase the potential **Security Risks**. Collectively, the new resource mix can be more susceptible to long-term, widespread **Extreme Events,** such as extreme temperatures or sustained loss of wind/solar, that can impact the ability to provide sufficient energy as the fuel supply is less certain. Furthermore, there is an associated increase in **Critical Infrastructure Interdependencies**. For example, for natural-gas-fired generation, there is increased interdependency on delivery of fuel from the natural gas industry that also depends on electricity to support its ability to extract and transport gas.

Although NERC does not specifically call out the risks relating to the design or implementation of EPA regulation of GHG emissions from power plants, the report includes decarbonization policy as part of the "energy policy" drivers of changes in demand and supply of electricity and other aspects of grid transformation. NERC's priority reliability risks report includes numerous recommendations to mitigate risks related to energy policy[70] (which NERC describes as including a wide range of federal, state and local policies relating to electrification of buildings and vehicles, other decarbonization policies, as well as adoption of central-station and decentralized renewable, low- and no-carbon resources, and other supply resources).

The NERC reliability risks report also includes recommendations in five other priority areas, which collectively address the complex planning, operational and other challenges that the industry must address to maintain system

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[69] NERC, "2023 ERO Reliability Risk Priorities Report" (RISC Approved 7-24-2023; NERC Board approved 8-17-2023) (hereafter "NERC Reliability Risk Priorities Report 2023"), https://www.nerc.com/comm/RISC/Related%20Files%20DL/RISC_ERO_Priorities_Report_2023_Board_Approved_Aug_17_2023.pdf. ("ERO" refers to Electric Reliability Organization.)

[70] "Increased coordination and collaboration between federal, provincial, and state policy makers, regulators, owners, and operators of the BPS as well as with the critical interdependent sectors is needed. Communication, coordination, and collaboration should be early, consistent, and clear to bridge increasingly complex jurisdictional lines. Education for policymakers and regulators to increase awareness of the reliability implications of policy decisions is a critical need. In addition, education for the industry, as the developers of reliability standards, is needed to better understand the processes and implications of policy decisions. Power system reliability requires many actively engaged, closely coordinated partners. NERC and state commissions share common goals in ensuring a reliable, resilient, safe, affordable electricity system that serves all customers. States, and the utilities they regulate, are responsible for the distribution systems, including DERs [distributed energy resources], and with some utilities responsible for resource acquisition and adequacy. As economic regulators, state commissions review and approve utility investment proposals which have long term impacts on power system reliability. State perspectives are important to NERC's success – translating BPS considerations to state-level needs, experience, and policy objectives. Concurrently, NERC's perspectives are important to the States' success..." NERC Reliability Risk Priorities Report 2023.

reliability. (I have included the full list of NERC recommendations in footnotes here to illustrate the number of actions that NERC recommends be taken in upcoming years, regardless of whether federal regulators put in place new requirements to regulate GHG emissions from fossil fuel power plants.) These other four areas are: grid transformation,[71] physical and cyber security,[72] extreme events,[73] and critical infrastructure interdependencies.[74]

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[71] "Grid transformation will continue to require new and innovative approaches, tools, methods, and strategies to be used in planning and operating the BPS. To address these challenges and opportunities, [NERC] encourages the following actions in order of evaluated criticality to have the most impact and likelihood of mitigating the risk: 1. Develop and include energy sufficiency approaches in planning and operating the grid….NERC and the industry should collaborate to better understand and define energy sufficiency and develop approaches that examine the magnitude, duration, and impact across all hours and many years while also considering limitations and contributions to reliability from all resources (including load resources), neighboring grids, and transmission….2. Ensure sufficient operating flexibility during resource and grid transformation….3. Further consider the impacts and benefits of DER resources, electrification, energy storage, hybrid resources, and other emerging technologies….4. Plan for large and rapid load growth….5. Expand marketing to and development of the workforce of the future….6. Expect and be open to dramatically new grid operation approaches and platforms." NERC Reliability Risk Priorities Report 2023.

[72] "1. NERC should develop guidance for industry on the best practices to mitigate the risks from cloud adoption and the use of AI technologies. 2. NERC should continue to facilitate the development of planning approaches, models, and simulation methods that may reduce the number of critical facilities and thus mitigate the impact relative to the exposure to attack. 3. The ERO should take the lead in encouraging government partners to create a supply chain certification system….4. NERC should develop guidance to define best practices for "Secure by Design" and "Adaptive Security" principles in information technology and operational technology systems development and implementation. 5. The Electricity Information Sharing Analysis Center (E-ISAC) should continue to encourage industry efforts on workforce cyber education… 6. NERC should highlight [and provide training on] key risk areas that arise from the EPRI's EMP [electromagnetic pulse] analysis for timely industry action….7. NERC, while collaborating with industry, should continue to evaluate the need for additional assessments of the risks from attack scenarios (e.g., vulnerabilities related to drone activity, attacks on midstream or interstate natural gas pipelines or other critical infrastructure)….8. E-ISAC should continue to execute its long-term strategy to improve cyber and physical security information-sharing, protection, risk analysis, and increase engagement within the electric sector as well as potential foreign adversaries should continue to be addressed by the E-ISAC, other federal partners, and industry to continue diligently working to mitigate threats. 10. The industry must continue to focus on early detection and response to cyber attacks and adopt controls that can be executed to protect critical systems. 11.….NERC should continue to expand the scope of GridEx [exercises] to include and collaborate with cross-sector industries, such as natural gas, telecom, and water as well as state, local, and tribal authorities….12. [Other efforts relating to cybersecurity risk Information sharing should continue]." NERC Reliability Risk Priorities Report 2023.

[73] "1. Conduct special assessments of extreme event impacts, including capturing lessons learned, create simulation models, and establish protocols and procedures for system recovery and resiliency… 2. Accelerate planning and construction of strategic, resilient transmission. …. For instance, prioritize transmission installation with the explicit objective of reducing resilience risk and ensuring "hardening" for anticipated risks….3. Development of tools for BPS resiliency: DOE is performing analyses to evaluate both static, dynamic, and real-time scenarios that affect BPS reliability and resilience including transmission needs and planning studies, and evaluation of asset performance under extremes. NERC should continue to work with DOE on these efforts to ensure robust tools that can be used industry wide to evaluate potential threats to generation, transmission, and fuel supplies. 4. Regional coordination: States and any other applicable governmental authorities should meet collectively to discuss and understand impacts to ensure they are a part of the resiliency discussion….5. Workforce development: Entities should continue to focus on attracting, developing, and retaining the skilled workforce needed to plan, construct, and operate the transforming [grid]. 6. Industry forums: Forums should share and coordinate information sharing on best practices around resiliency efforts related to design considerations, supply chain deliverability issues, and identification and response to major storm events….7. Drills and emergency response: BPS operators should have formal emergency management programs that include periodic drills and exercises…8. Understanding of geomagnetic disturbance events on BPS." NERC Reliability Risk Priorities Report 2023.

[74] "1. NERC should conduct a study to determine the percent of available generation with on-site or firm fuel capacity in each Regional Entity….NERC and industry partners should continue to conduct meetings and conferences to highlight the importance of cross-sector and energy subsector interdependence and coordination, such as the NERC Reliability Summit, NATF/EPRI resiliency summits, the North American Energy Standards Board Forum, and FERC/DOE technical conferences….NERC, in collaboration with industry and industry partners, should continue to identify and prioritize limiting conditions and/or contingencies that arise from other sectors that affect the BPS. NERC and Reliability Coordinators should continue to conduct special assessments that address natural gas availability and pipeline common mode failures. NERC and industry partners should continue to increase emphasis on cross-sector coordination in industry drills ….NERC should investigate the feasibility of potential infrastructure improvements, such as feeder segmentation required to facilitate more pinpoint control of load during emergencies in order to increase the amount of load available for rotating outages. The EPRI and DOE should continue their work on communication alternatives but also the use of same or similar technologies for critical supervisory control and data acquisition data. New technologies should be explored that could assist in providing unique and hardened back-up telecommunication methods for the most critical data. The ERO Enterprise should continue to communicate to state, provincial,

These recommendations encompass a wide variety of actors in industry and government, and touch on specific areas of needed analysis, information sharing and coordination over time as conditions continue to change.

There are other discussions – e.g., in Texas, at FERC-regulated Regional Transmission Organizations ("RTOs"), and at the North American Energy Reliability Board ("NAESB")[75] – to address problems and concerns relating to preparedness and performance of electric facilities and in gas production and delivery, particularly in extreme weather situations. FERC/NERC's reports, for example, concluded that all types of generating technologies failed to adequately prepare for extreme cold weather or freezing conditions, with gas-fired units experiencing significant incremental unplanned outages, in part due to gas production, supply and delivery issues constituting the second-largest cause of unplanned outages after mechanical issues relating to cold and freezing conditions.[76] FERC/NERC's recommendations reflect the lessons learned from past events, including FERC/NERC's specific recommendations to identify critical facility components and systems that need freeze-protection measures and to prepare and execute plans to address such winterization.[77]

I note that many of these recommendations are similar – and in some cases, identical – to recommendations in reports, forums, and studies with which I have been personally involved and which focused on critical actions needed to address the complex changes already underway in the nation's electric system. For example, the National Academies' Future of Electric Power in the U.S. study identified five "major needs" for the future electric power system, including the following (and also made recommendations related to each one): (1) improving our understanding of how the system is evolving; (2) ensuring that electricity service remains clean and sustainable, and reliable and resilient; (3) improving understanding of how people use electricity and keep electricity affordable and equitable in the face of profound change; (4) facilitating innovation in technology, policy and business models relevant to the power system; and (5) accelerating innovation in technology in the face of shifting global supply chains and the influx of disruptive technologies.[78] The National Academies' Net Metering Study describes the local reliability systems that need greater visibility, operational controls and other mechanisms to be ready for increasing deployment of distributed energy resources with new power flows on the grid.[79]

Many of these broader concerns show up in comments and concerns raised in the context of EPA's proposed regulation of existing and new fossil generating units, even though EPA's proposal did not create these issues.

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and federal regulators of natural gas about the critical interdependence of this fuel source with the other infrastructure sectors. NERC and industry partners should continue to evaluate voice and data communication interdependencies and strategies for ensuring continuous communications during an emergency event, particularly as remote working arrangements grow. NERC should continue to encourage industry to consider the unavailability of other critical infrastructures, such as water, sewer, roads, rails, and communications in their emergency plans." NERC Reliability Risk Priorities Report 2023.

[75] North American Energy Standards Board, "Gas Electric Harmonization Forum Report," July 28, 2023, https://naesb.org/pdf4/geh_final_report_072823.pdf. I served as a co-chair of this Forum and co-authored the Foreword with my two co-chairs, Robert Gee and Pat Wood, III.

[76] See, for example, Section IV of the February 2021 Cold Weather Outages staff report by FERC/NERC/Regional Entities. https://www.ferc.gov/media/february-2021-cold-weather-outages-texas-and-south-central-united-states-ferc-nerc-and.

[77] See, for example, Section IV of the February 2021 Cold Weather Outages staff report by FERC/NERC/Regional Entities. https://www.ferc.gov/media/february-2021-cold-weather-outages-texas-and-south-central-united-states-ferc-nerc-and.

[78] NASEM Future of Electric Power Study.

[79] NASEM Net Metering Study, especially chapters 2, 6, and 7.

B. Reliability-related themes in comments on EPA's 2023 proposal

Several themes emerge from comments on reliability implications of EPA's proposed power plant GHG rule. These concerns include: the already-challenging operational conditions in the electric system; challenges relating to the ability of the industry to expand the transmission system; and the role of the proposal in leading to premature fossil unit retirements.

First, regarding challenging operational conditions on the electric system as a result of potential increases in demand and changes in the supply portfolio: Whether or not EPA moves forward with its proposed rule, such conditions are present and will continue to grow as operational changes and challenges, as discussed in the prior section. NERC's recommendations in its 2023 priority reliability risks report detail a broad and deep array of actions that should and can be taken to address these issues (including the impacts of any incremental changes introduced by promulgation of EPA's rule). As noted in NERC's report, these efforts are important to undertake now.

Additionally, the long list of specific recommendations that my colleagues and I previously identified as important tools and practices for assuring reliability in the context of EPA's adoption of prior regulations of GHG emissions from power plants still remain relevant here.[80] That report identified the array of key players with responsibilities that relate directly or indirectly to electric-system reliability – including FERC, other federal agencies, NERC, regional reliability organizations, system operators and balancing authorities, states, vertically integrated utilities, other power plant owners, energy efficiency program operators, and others – and potential actions that they can consider taking in the context of new EPA GHG regulations.

If the EPA's proposed rule is finalized in 2024 as anticipated by EPA, the industry will have nearly a decade to address any incremental reliability issues introduced by the rule and shaped by states' SIPs over the subsequent two years (and where the states can hear input from industry stakeholders about how to introduce greater flexibility into their plans).

Most of the nation's power plant capacity is not covered by these regulations, and includes nuclear facilities,[81] central station and distributed renewable facilities,[82] and existing combustion turbine units that are smaller than 300 MW or that operate infrequently (i.e., less that 50percent capacity factor). Notably, most existing gas-fired combustion turbines (operating as stand-alone peaking units or in combined cycle configurations) are smaller than 300 MW and therefore not covered by the proposal. According to the Energy Information Administration's current inventory of power plants, a significant share of such capacity (and associated generating units) is in this "less than 300 MW in size" category, as shown in Table 2:

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[80] See recommendation Tables 1-6 in Tierney et al. Reliability Tools and Practices (Attachment 1 to this report). https://hepg.hks.harvard.edu/sites/hwpi.harvard.edu/files/hepg/files/electric_system_reliability_and_epas_clean_power_plan_0215.pdf?m=1529956845.

[81] Nuclear generating capacity amounts to 100.5 GW. EIA Monthly Generator Inventory (existing generating units with 1 MW or greater capacity (nameplate)), August 2023 (hereafter "EIA Generator Inventory"), https://www.eia.gov/electricity/data/eia860M/.

[82] Capacity of hydro, wind, solar, and geothermal generating facilities greater than 1 MW amounts to 311 GW. EIA Generator Inventory.

Table 2: Existing Gas-Fired Combustion Turbines (Simple Cycle and Combined Cycle)

Gas-Fired CTs	Total In Operation		Total In Operation And <300 MW in Size		Total In Operation and >300 MW in Size	
	# of units	GW total	# of units	GW total	# of units	GW total
CTs (simple cycle CTs)	1,755	141 GW	1,753	140.3 GW	2	0.7 GW
CCs (combined cycle CTs)	1,540	291 GW	1,359	219.0 GW	181	72.0 GW
**All Gas-Fired CTs	3,295	432 GW	3,112	359.3 GW	183	72.7 GW
Percentage of Currently Operating Gas-Fired CTs affected by EPA proposal			94% not covered	83% not covered	6% covered	17% covered

Source:
EIA Monthly Generator Inventory (existing generating units with 1 MW or greater capacity (nameplate)), August 2023, https://www.eia.gov/electricity/data/eia860M/.

An additional 43.7 GW of existing coal capacity[83] is currently scheduled to retire by 2032 (an amount equivalent to 24 percent of total coal-fired capacity) and needs only to perform routine O&M to comply with the EPA proposal. Also, 4.3 GW of coal-fired capacity has planned retirements in 2032 and 2033, thus similarly complying with EPA's proposal if their capacity factor is below 20 percent. This reflects another 2 percent of currently operating coal-fired steam unit capacity. Given that the EPA Section 111(d) rule is not finalized much less in effect, it is reasonable to assume that market forces and other public policies (and/or utility commitments) have led to such existing retirement announcements.

Note that current estimates of lead times for permitting and constructing new non-renewable capacity are: 24 months for battery storage; 36 months for gas-fired simple cycle CTs; and 48 months for gas-fired combined cycles.[84] Even a doubling of such time frames – such as to account quite conservatively for permitting delays or other extensions of lead times for individual projects – could allow for the economical and timely development of new facilities. Many projects are already in interconnection queues or in development, permitting, financing, and/or construction stages, and may be completed and interconnected in the years leading up to proposed implementation of the more stringent elements of EPA's proposals (e.g., post 2032). Before then, new gas-fired facilities entering service are only held to the use of efficient current CT and CC technologies. Of course, significant quantities of wind and renewable capacity are also in some stage of project development.

Second, regarding challenges in the nation's ability to expand the transmission system to support changes in the electric system: Certainly, the difficulties of adding transmission are well known and being addressed in many

[83] EIA's inventory indicates that 92 existing conventional coal units owned by utilities and independent power products and currently in operations have announced retirements by the end of 2031. EIA Generator Inventory.

[84] Paul Hibbard, Todd Schatzki, Charles Wu and Christopher Llop (Analysis Group) & Matthew Lind, Kiernan McInerney, and Stephanie Villarreal (Burns & McDonnell), "Independent Consultant Study to Establish New York ICAP Demand Curve Parameters for the 2021/2022 through 2024/2025 Capability Years – Final Report," September 9, 2020.

fora.[85] FERC has opened and received comments in a proposed rulemaking on transmission planning, cost allocation and interconnection, with final rules issued on generator interconnections in July 2022.[86]

The Infrastructure Investment and Jobs Act acknowledged such challenges in its provisions that provide expanded federal authorities to facilitate transmission expansion. The Congressional Research Service summarized these transmission-related activities as follows:

> Section 40105 of IIJA revises the process for designation of a National Interest Electric Transmission Corridor (NIETC) by the Department of Energy (DOE). A key revision allows for an NIETC designation that may lead to new interstate transmission lines specifically for intermittent (e.g., renewable) energy to connect to the electric grid. Another key change in the section enhances FERC's "backstop" siting authority for transmission lines in NIETCs. This would allow FERC to supersede traditional state permitting of transmission facilities and issue a permit for the construction and operation of certain interstate facilities under defined circumstances, including when a state has denied an applicant's request to site transmission facilities.
>
> Section 40106 establishes the ''Transmission Facilitation Program,'' under which DOE can facilitate the construction of electric power transmission lines and related facilities. Under this program, DOE may potentially enter a capacity contract (for no more than 40 years or 50 percent of the total capacity) with respect to an eligible transmission project; issue a loan to an eligible entity for an eligible transmission project; or participate with an eligible entity in designing, developing, constructing, operating, maintaining, or owning an eligible transmission project. Thus, under a capacity project, DOE could be closely involved in operational support of eligible transmission-line construction. Such an arrangement could help move a transmission project from proposal to construction, as a transmission project is unlikely to be built without significant customer commitment to its use. Section 40106 also establishes a "Transmission Facilitation Fund" to help finance eligible projects deemed to be in the public interest.

The Department of Energy has established a Grid Deployment office and has already made a number of significant commitments in support of new transmission. Recently announced actions include the agency's

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[85] *See*, for example: NASEM Future of Electric Power study; NASEM Decarbonization study; Institute for Policy Integrity, "Transmission Siting Reforms in the Infrastructure and Jobs Act of 2021," December 2021, https://policyintegrity.org/files/publications/Building_a_New_Grid_Policy_Brief_v3_%281%29.pdf; Institute for Policy Integrity, Memo to DOE Grid Deployment Office on Coordination of Federal Authorizations for Electric Transmission Facilities, October 2, 2023, https://policyintegrity.org/documents/Comments_of_Institute_for_Policy_Integrity.pdf; Liza Reed et al., "How are we going to build all that clean energy infrastructure?", Niskanen Center, August, 2021, https://www.niskanencenter.org/wp-content/uploads/2021/08/CATF_Niskanen_CleanEnergyInfrastructure_Report.pdf; James Hewett, "Advancing U.S. Transmission Deployment: Navigating the Policy Landscape," Breakthrough Energy. August 7, 2023, https://breakthroughenergy.org/news/transmissiondeployment/.

[86] FERC, "Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection," 179 FERC ¶ 61,028, No. RM21-17-000, April 21, 2022, https://www.ferc.gov/media/rm21-17-000; https://www.ferc.gov/electric-transmission/generator-interconnection.

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commitment of $1.3 billion to help fund three major new transmission projects[87] and the publication of the National Transmission Needs Study.[88] Combined with the new authorities provided by Congress to DOE and FERC, and the current efforts of the DOE to use them, it is reasonable to assume that transmission bottlenecks and challenges are being addressed on a timeframe consistent with the compliance milestones anticipated by EPA in its proposed rule. Moreover, EPA's assessment of the impacts of the 2023 proposal are relatively conservative with regard to their assumptions about expansion of the interstate transmission system in support of development of renewable electricity projects.[89]

Notably, also, transmission expansion designed to support reliability outcomes tends to be approved more readily than projects aimed primarily at providing economic savings or to support public policy. To the extent that reliability challenges complicate fossil generating units' compliance strategies (e.g., including retirements, as discussed further below), there are numerous examples of successful siting approvals for such lines.[90]

Third, regarding premature retirements of fossil steam units (especially coal-fired generating units): The trends in retirements of coal-fired generation are driven principally by fundamental market economics.[91] EPA's rule allows for plants to stay in operation until the end of 2034 – a decade from now – if the unit maintains a capacity factor of no more than 20 percent (or for any level of output if a unit is retired by 2032). Already, there are dozens of coal-fired steam units with recent capacity factors below or around that levels.[92] And currently, plant owners have indicated retirement plans of approximately a quarter of total coal-fired steam capacity by those dates. Plants that commit to retire by the end of 2039 (fully 15 years from now) will need to co-fire with natural gas starting in 2030. The EPA has modeled estimated retirements of coal plants, but what will ultimately matter from a reliability point of view is the resource adequacy and other operating conditions on the grid at the time a plant is actually planning on retiring. These timelines are many years away.

To the extent that a unit has not yet announced retirement and operating conditions lead to an owner's decision to retire it (due to an uneconomic financial outlook for the facility) by any of those milestone dates, the unit's owner will need to get permission (from a reliability point of view) to retire the facility to determine whether taking the plant permanently out of service would trigger local or regional reliability issues. Most coal-fired generating capacity is either (a) owned by a vertically integrated utility with the ability to request cost recovery of a unit until alternative resources are in place to allow it to retire without adverse consequences to local reliability, or (b) not owned by a

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[87] DOE, "DOE Launches New Initiative from President Biden's Bipartisan Infrastructure Law to Modernize National Grid," January 12, 2022, https://www.energy.gov/oe/articles/doe-launches-new-initiative-president-bidens-bipartisan-infrastructure-law-modernize; DOE, "Biden-Harris Administration Announces $1.3 Billion to Build Out Nation's Electric Transmission and Releases New Study Identifying Critical Grid Needs," October 30, 2023, https://www.energy.gov/articles/biden-harris-administration-announces-13-billion-build-out-nations-electric-transmission.

[88] DOE, "National Transmission Needs Study," October 2023, https://www.energy.gov/sites/default/files/2023-10/National_Transmission_Needs_Study_2023.pdf.

[89] See comments of Clean Air Task Force and Natural Resources Defense Council, EPA Docket No. EPA-HQ-OAR-2023-0072, August 8, 2023, pages 45-51, https://cdn.catf.us/wp-content/uploads/2023/08/09090744/CATF-and-NRDC-Comments-on-Proposed-Rule-EPA-HQ-OAR-2023-0072-1.pdf?_gl=1*1ork94d*_ga*MjEyMzQ4MDA3LjE2OTU4NzY5MzA.*_ga_88025VJ2M0*MTY5ODQzOTUyMy40LjAuMTY5ODQzOTUyNC42MC4wLjA.*_gcl_au*MTIxNTk3MjA0Ni4xNjk1ODc2OTMw.

[90] NASEM, Future of Electric Power.

[91] NASEM Decarbonization: Chapters 6 (The Essential Role of Clean Electricity) and Chapter 12 (The Future of Fossil Fuels).

[92] SPGlobal Regional Power Summary, accessed 11-1-2023.

regulated utility but operates in an RTO region which can put in place reliability-must-run compensation arrangements to cover plant O&M costs to keep it in service until alternatives (including wires and non-wires alternatives) are in place, if needed for reliability.[93]

EPA's Resource Adequacy TSD refers to these and other options as mechanisms that help to ensure reliable system operations, which the agency has taken into account in the development of its proposal and accompanying implementation approach.

> The emission reduction requirements under this rule are based on adequately demonstrated cost-reasonable control measures that form the BSER. Some EGU owners may conclude that, all else being equal, retiring a particular EGU and replacing it with cleaner generating capacity is likely to be a more economic option from the perspective of the unit's customers and/or owners than making substantial investments in new emissions controls at the unit. However, the EPA also understands that before implementing such a retirement decision, the unit's owner will follow the processes put in place by the relevant regional transmission organization (RTO), balancing authority, or state regulator to protect electric system reliability. These processes typically include analysis of the potential impacts of the proposed EGU retirement on electrical system reliability, identification of options for mitigating any identified adverse impacts, and, in some cases, temporary provision of revenues to support the EGU's continued operation until longer-term mitigation measures can be put in place. The Agency also expects that any resulting unit retirements will be carried out through an orderly process in which RTOs, balancing authorities, and state regulators use their powers to ensure that electric system reliability is protected.[94]

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[93] Tierney et al Electric Reliability Tools and Practices; Paul Hibbard, Pavel Darling and Susan Tierney, "Potomac River Generating Station: Update on Reliability and Environmental Considerations," July 19, 2011, https://www.cleanskies.org/wp-content/uploads/2011/07/PRGSReportAnalysisGroup2011.pdf.

[94] EPA, Resource Adequacy Technical Support Document, https://www.regulations.gov/document/EPA-HQ-OAR-2023-0072-0034.

More specifically, the EPA Preamble further describes the reliability options available within the proposed rule and existing in current policy, as excerpted in the text box here:

EPA Preamble
Section XIV.F: Grid Reliability Considerations (excerpts)

Preserving the ability of power companies and grid operators to maintain system reliability has been a paramount consideration in the development of these proposed actions.

Accordingly, these proposed rules include significant design elements that are intended to allow the power sector continued resource and operational flexibility, and to facilitate long-term planning during this dynamic period. Among other things, these elements include subcategories of new natural gas-fired combustion turbines that allow for the stringency of standards of performance to vary by capacity factor; subcategories for existing steam EGUs that are based on operating horizons and fuel reflecting the request of industry stakeholders; compliance deadlines for both new and existing EGUs that provide ample lead time to plan; and proposed State plan flexibilities.

In addition, this preamble discusses EPA's intention to exercise its enforcement discretion where needed to address any potential instances in which individual EGUs may need to temporarily operate for reliability reasons, and to set forth clear and transparent expectations for administrative compliance orders to ensure that compliance with these proposed rules can be achieved without impairing the ability of power companies and grid operators to maintain reliability. As such, these proposed rules provide the flexibility needed to avoid reliability concerns while still securing the pollution reductions consistent with section 111 of the CAA.

The EPA routinely consults with the DOE and FERC on electric reliability and intends to continue to do so as it develops and implements a final rule. This ongoing engagement will be strengthened with routine and comprehensive communication between the agencies under the DOE–EPA *Joint Memorandum of Understanding on Interagency Communication and Consultation on Electric Reliability* signed on March 8, 2023.716 The memorandum will provide greater interagency engagement on electric reliability issues at a time of significant dynamism in the power sector, allowing the EPA and the DOE to use their considerable expertise in various aspects of grid reliability to support the ability of Federal and State regulators, grid operators, regional reliability entities, and power companies to continue to deliver a high standard of reliable electric service….

In addition, the EPA observes that power companies, grid operators, and State public utility commissions have well-established procedures in place to preserve electric reliability in response to changes in the generating portfolio, and expects that those procedures will continue to be effective in addressing compliance decisions that power companies may make over the extended time period for implementation of these proposed rules. In response to any regulatory requirement, affected sources will have to take some type of action to reduce emissions, which will generally have costs.

Some EGU owners may conclude that, all else being equal, retiring a particular EGU is likely to be the more economic option from the perspective of the unit's customers and/or owners because there are better opportunities for using the capital than investing it in new emissions controls at the unit. Such a retirement decision will require the unit's owner to follow the processes put in place by the relevant RTO, balancing authority, or State regulator to protect electric system reliability. These processes typically include analysis of the potential impacts of the proposed EGU retirement on electrical system reliability, identification of options for mitigating any identified adverse impacts, and, in some cases, temporary provision of additional revenues to support the EGU's continued operation until longer-term mitigation measures can be put in place.

In some rare instances where the reliability of the system is jeopardized due to extreme weather events or other unforeseen emergencies, authorities can request a temporary reprieve from environmental requirements and constraints (through DOE) in order to meet electric demand and maintain reliability. These proposed actions do not interfere with these already available provisions, but rather provides a long-term pathway for sources to develop and implement a proper plan to reduce emissions while maintaining adequate supplies of electricity.

C. Other Technical Issues raised about reliability implications of EPA's 2023 Proposal

In addition to the broader, thematic issues discussed in the prior section, several other technical reliability-related issues have been raised in stakeholder comments.

For example, although critics acknowledge that EPA discusses resource adequacy issues, EPA has been criticized for not having modeled or sufficiently accounted for *operational reliability* issues in considering the feasibility of the implementation of the proposed rule.[95]

NERC defines these two major reliability concepts in the following way: Resource adequacy is "'[t]he ability of the electric system to supply the aggregate electrical demand and energy requirements of the end-use customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements.'" By contrast, operational reliability, or system security, requires "[o]perating the elements of the [Bulk-Power System] within equipment and electric system thermal, voltage, and stability limits so that instability, uncontrolled separation, or cascading failures of such system will not occur as a result of a sudden disturbance, including a cybersecurity incident, or unanticipated failure of system elements."[96]

Resource adequacy considerations indeed differ from operational reliability ones, but EPA has not erred in modeling only the former. It is not reasonable to expect that at this point in time EPA should have modeled operational-reliability outcomes for the nation – that is, prior to actual promulgation of standards that (a) require state implementation plans to be developed, (b) require compliance obligations no earlier than 2030, and (c) allow for flexibility in owners' decisions about how to comply with the eventual standards and SIPs.

It would be unrealistic to expect that EPA (or even anyone with operational responsibility for the grid) to know the specific future compliance decisions of power plant owners that would be required to conduct meaningful detailed system impact studies across all regions of the country affected by the new standards starting nearly a decade from now. Operational security studies are location specific and quite granular in form. Given the long lead times available in the proposed regulatory approach, power plant owners will need to make decisions about technology and/or fuel choices, and/or whether to retire a unit or operate it at a low capacity factor in future years and when many other changes have occurred on the grid, in electricity markets, and so forth. Moreover, EPA has provided the types of flexible compliance options and timing runways that will allow decision makers about specific power plants' compliance to explore such operational security considerations at the time and location when they are most relevant.

Other commenters have raised concerns about the performance characteristics of different types of generating resources as assumed by EPA in its analyses.[97] Certainly, different generating technologies operate in different

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[95] See, for example, PGen Comments.

[96] Paul Hibbard, Susan Tierney and Katherine Franklin, "Electricity Markets, Reliability and the Evolving Power System," June 2017, page 42, https://www.analysisgroup.com/globalassets/content/insights/publishing/ag_markets_reliability_final_june_2017.pdf, citing NERC's glossary of terms, available at http://www.nerc.com/files/glossary_of_terms.pdf.

[97] For example, a criticism is that technologies like wind or solar projects cannot be counted on to meet peak demand and thus have a lesser value from a resource adequacy point of view. PGen Comments; NRECA Comments.

modes, with combinations of characteristics – start-up and ramping speeds, fuel that is on-site (e.g., nuclear or conventional hydro) or subject to just-in-time delivery (e.g., natural gas) or tied to natural conditions (e.g., windiness or solar radiation), and so forth. Operational reliability depends on complex factors that system operators and electric companies bring to bear in real time, as my colleagues and I have previously explained:

> System operations are affected in real time by several things:
>
> - The mix of attributes of the resources on the system – their location, their fuel source, and the operating characteristics of the supply and demand resources;
> - The continuous variations in system conditions (e.g., variations in load as consumption changes; the sudden loss of a power plant or transmission line; changes in ambient conditions or sudden power outages due, e.g., to a storm); and
> - The system operator's practices and procedures for managing the changing conditions on the system at all times and in all places under that operator's responsibility, to assure that the system stays in balance.
>
> System security describes the ability of the system to meet ever changing system conditions, and to do so with enough redundancy in operational capabilities to manage and recover from a variety of potential system events – or "contingencies" – such as sudden and unexpected loss of generation, transmission, or load. System planners and operators must ensure that the technical capabilities of the mix of resources on the power system are capable of responding in real time to normal load changes and contingency events. This is needed to avoid the catastrophic wide-area failure of the bulk power system - such as a cascading outage covering one or more regions - that can come from unacceptable variations in system voltage and frequency….
>
> Importantly, system security, or operational reliability, does not result from a singular condition, such as the percentage of a system's capacity that operates in "baseload" mode. To maintain operational reliability, system operators use a combination of strategies, tools, procedures, practices, and resources to keep the entire system in balance even as conditions change on a moment to moment basis. The difficulty of this task largely results from several things, and occurs along different time frames.

In the end, on-the-ground reliability will result from a combination of technologies with different attributes (e.g., capacity, energy production, capacity factors, dispatchability, fuel delivery, ramping speed, ability to provide voltage support, and so forth). Operational reliability depends upon the attributes of thousands of physical elements of and market conditions affecting the bulk power system and local electricity distribution systems.

Some commenters[98] have argued that EPA has assumed an inappropriate "replacement rate" in modeling when renewable resources replace capacity lost when coal unit retire. While it is certainly the case that wind or solar

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[98] PGen Comments.

facilities do not replace the combination of energy and capacity of some other types of technologies, such as nuclear plants, with their typical 90-percent capacity factors, or particular coal-fired or gas-fired generating units that have similarly high current capacity factors, there are many existing fossil units where extremely low capacity factors and fuel-delivery considerations (e.g., absence of firm gas pipeline delivery arrangements) suggest that it would be reasonable to presume a priori a "standard" replacement ratio across these technologies.

The more important consideration in modeling is to identify the amount of capacity AND energy that needs to be replaced on a system when determining what is needed upon the retirement of a unit with a particular operating profile (e.g., whether it is dispatchable with around the clock output capability and without fuel delivery constraints, versus an intermittent resource available either when its wind or solar energy source is available or when its electrical output can be combined with storage to provide dispatchable service subject to the operating constraints of the storage system). The availability of wind and solar output (e.g., capacity factor; capacity reliably available at the time of system peak) will depend upon a number of factors, such as the quality of the wind or solar resource, the height of towers, the age of the facility, the tilt of solar panels, the size of the solar installation). Capacity values are under review (and will continue to need to be assessed over time), not just of intermittent resources but also for resources that depend upon just-in-time deliveries of fuel (e.g., gas-fired power plants that require deliveries during extreme weather events).

EPA's analysis has been careful to provide reasonable estimates of future system conditions, and moreover the agency's design of the proposed rule provides many options for reasonable accommodation of and support for electric reliability considerations.

Attachment 1: Tierney et al., Reliability Tools and Practices (2015)

Susan Tierney, Paul Hibbard and Craig Aubuchon,

"Electric System Reliability and the EPA's Clean Power Plan: Tools and Practices,"

February 2015

Report link:
https://www.analysisgroup.com/globalassets/content/insights/publishing/electric_system_reliability_and_epas_clean_power_plan_tools_and_practices.pdf

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Electric System Reliability and EPA's Clean Power Plan: Tools and Practices

Analysis Group

Susan Tierney
Paul Hibbard
Craig Aubuchon

February 2015

Acknowledgments

This report provides a primer on various reliability issues facing the electric industry as it looks ahead to implementation of the Clean Power Plan, as proposed by the U.S. Environmental Protection Agency on June 2, 2014.

Taking into consideration the many comments of various parties filed on EPA's proposal, the report addresses issues that the nation and the electric industry need to address in order to simultaneously meet electric system reliability and carbon-emissions reduction obligations.

This is an independent report by the authors at the Analysis Group, supported by funding from the Energy Foundation.

The report, however, reflects the analysis and judgment of the authors only.

About Analysis Group

Analysis Group provides economic, financial, and business strategy consulting to leading law firms, corporations, and government agencies. The firm has more than 600 professionals, with offices in Boston, Chicago, Dallas, Denver, Los Angeles, Menlo Park, New York, San Francisco, Washington, D.C., Montreal, and Beijing.

Analysis Group's energy and environment practice area is distinguished by expertise in economics, finance, market modeling and analysis, regulatory issues, and public policy, as well as significant experience in environmental economics and energy infrastructure development. The practice has worked for a wide variety of clients including: energy producers, suppliers and consumers; utilities; regulatory commissions and other public agencies; tribal governments; power system operators; foundations; financial institutions; and start-up companies, among others.

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Executive Summary

Since the U.S. Environmental Protection Agency (EPA) proposed its Clean Power Plan last June, many observers have raised concerns that its implementation might jeopardize electric system reliability.

Such warnings are common whenever there is major change in the industry, and play an important role in focusing the attention of the industry on taking the steps necessary to ensure reliable electric service to Americans. There are, however, many reasons why carbon pollution at existing power plants can be controlled without adversely affecting electric system reliability.

Given the significant shifts already underway in the electric system, the industry would need to adjust its operational and planning practices to accommodate changes even if EPA had not proposed the Clean Power Plan.

In the past several years, dramatic increases in domestic energy production (stemming from the shale gas revolution), shifts in fossil fuel prices, retirements of aged infrastructure, implementation of numerous pollution-control measures, and strong growth in energy efficiency and distributed energy resources, have driven important changes in the power sector. As always, grid operators and utilities are already looking at what adjustments to long-standing planning and operational practices may be needed to stay abreast of, understand, and adapt to such changes in the industry.

The standard reliability practices that the industry and its regulators have used for decades are a strong foundation from which any reliability concerns about the Clean Power Plan will be addressed.

The electric industry's many players are keenly organized and strongly oriented toward safe and reliable operations. There are well-established procedures, regulations and enforceable standards in place to ensure reliable operations of the system, day in and day out.

http://imgkid.com/checklist-icon.shtml

Among other things, these "business-as-usual" procedures include:

- Assigning specific roles and responsibilities to different organizations, including regional reliability organizations, grid operators, power plant and transmission owners, regulators, and many others;
- Planning processes to look ahead at what actions and assets are needed to make sure that the overall system has the capabilities to run smoothly;
- Maintaining secure communication systems, operating protocols, and real-time monitoring processes to alert participants to any problems as they arise, and initiating corrective actions when needed; and
- Relying upon systems of reserves, asset redundancies, back-up action plans, and mutual assistance plans that kick in automatically when some part of the system has a problem.

http://www.bls.gov/ooh/installation-maintenance-and-repair/line-installers-and-repairers.htm

As proposed by EPA, the Clean Power Plan provides states and power plant owners a wide range of compliance options and operational discretion (including various market-based approaches, other means to allow emissions trading among power plants, and flexibility on deadlines to meet interim targets) that can prevent reliability issues while also reducing carbon pollution and cost.

EPA's June 2014 proposal made it clear that the agency will entertain market-based approaches and other means to allow emissions trading within and across state lines. Examples include emissions trading among plants (e.g., within a utility's fleet inside or across state lines), or within a Regional Transmission Organization (RTO) market. In this respect, the Clean Power Plan is fundamentally different from the Mercury and Air Toxics Standard (MATS) and is well-suited to utilize such flexible and market-based approaches. Experience has shown that such approaches allow for seamless, reliable implementation of emissions-reduction targets. In its final rule, EPA should clarify acceptable or standard market-based mechanisms that could be used to accomplish both cost and reliability goals.

Moreover, EPA has stated repeatedly that it will write a final rule that reflects the importance of a reliable grid and provides the appropriate flexibility.[1] We support such adjustments in EPA's final rule as needed to ensure both emissions reductions and electricity reliability.

Some of the reliability concerns raised by stakeholders about the Clean Power Plan presume inflexible implementation, are based on worst-case scenarios, and assume that policy makers, regulators, and market participants will stand on the sidelines until it is too late to act. There is no historical basis for these assumptions. Reliability issues will be solved by the dynamic interplay of actions by regulators, entities responsible for reliability, and market participants with many solutions proceeding *in parallel*.

Some of the cautionary comments are just that: calls for timely action. Many market participants have offered remedies (including readiness to bring new power plant projects, gas infrastructure, demand-side measures, and other solutions into the electric system where needed).[2] Indeed, this dynamic interplay is one reason why a recent survey of over 400 utility executives nationwide found that more than 60 percent felt optimistic about the Clean Power Plan and either supported EPA's proposed current emissions reduction targets or would make them more stringent.[3]

We note many concerns about electric system reliability can be resolved by the addition of new load-following resources, like peaking power plants and demand-side measures, which have relatively short lead times.[4] Other concerns are already being addressed by ongoing work to improve market rules, and by infrastructure planning and investment. A recent Department of Energy (DOE) report found that while a low-carbon electric

[1] See, for example, the January 6, 2015 blog post of Janet McCabe, EPA's Acting Administrator for Air and Radiation, "Time and Flexibility: Keys to Ensuring Reliable, Affordable Electricity," http://blog.epa.gov/epaconnect/2015/01/time-and-flexibility/. Also, see EPA's October 2014 Notice of Data Availability (NODA) that sought comments on, among other things, the potential to change the phase-in of emissions reductions to accommodate, for example, any constraints in natural gas distribution infrastructure, or how states could earn compliance credits for actions taken between 2012 and 2020.

[2] Although we think it is ultimately a good thing that the industry is paying close attention to reliability issues – so that any potential problems can be avoided through planning and infrastructure – we do note that serious questions have been raised about the assumptions used in recent reliability assessments performed by the North American Reliability Corporation (NERC). For example, Brattle Group's February 2015 report found that NERC failed to account for how industry is likely to respond to market and operational changes resulting from the Clean Power Plan. See Jurgen Weiss, Bruce Tsuchida, Michael Hagerty, and Will Gorman, "EPA's Clean Power Plan and Reliability: Assessing NERC's Initial Reliability Review," The Brattle Group, February 2015.

[3] The same survey found that utility executives believe that distributed energy resources offer the biggest growth opportunity over the next five years, and more than 70 percent expect to see a shift away from coal towards natural gas, wind, utility-scale solar and distributed energy. Utility Dive and Siemens, "2015 State of the Electric Utility Survey Results," January 27, 2015. The survey included 433 U.S. electric utility executives from investor-owned and municipal utilities, and electric cooperatives.

[4] Our report provides typical timelines for various types of resource additions in Section II.

system may significantly increase natural gas demand from the power sector, the projected incremental increase in natural gas pipeline capacity additions is modest (lower than historic pipeline expansion rates), and that the increasingly diverse sources of natural gas supply reduces the need for new pipeline infrastructure.[5]

Some other comments raise the reliability card as part of what is – in effect – an attempt to delay or ultimately defeat implementation of the Clean Power Plan. We encourage parties to distinguish between those who identify issues and offer solutions, and those who (incorrectly) suggest that reducing carbon pollution through the Clean Power Plan is inconsistent with electric system reliability.

In the end, because there are such fundamental shifts already underway in the electric industry, inaction is the real threat to good reliability planning. Again, there are continuously evolving ways to address electric reliability that build off of strong standard operating procedures in the industry.

There are many capable entities focused on ensuring electric system reliability, and many things that states and others can do to maintain a reliable electric grid.

First and foremost, states can lean on the comprehensive planning and operational procedures that the industry has for decades successfully relied on to maintain reliability, even in the face of sudden changes in industry structure, markets and policy.

Second, states should take advantage of the vast array of tools available to them and the flexibility afforded by the Clean Power Plan to ensure compliance is obtained in the most reliable and efficient manner possible. Given the interstate nature of the electric system, we encourage states

Entities with roles to play as part of ensuring electric system reliability and timely compliance with EPA's Clean Power Plan	
Electric Reliability Entities	Federal Energy Regulatory Commission (FERC)
	North American Electric Reliability Corporation (NERC)
	Regional Reliability Organizations
	Electric System Operators and Balancing Authorities
Other public entities	Environmental Protection Agency (EPA)
	States (air agencies, public utility commissions, energy offices, state legislatures)
	Other federal agencies (Department of Energy, Energy Information Administration)
Entities involved with markets, resource planning, procurements	Wholesale market administrators
	Electric utilities (investor-owned, municipal utilities, cooperatives, joint action agencies
Other organizations that have a role to play	Non-utility generating companies and providers of other technologies
	Interstate natural gas pipeline companies (and storage suppliers)
	North American Energy Standards Board (NAESB)
	Energy efficiency program administrators
	Others

[5] U.S DOE, "Natural Gas Infrastructure Implications of Increased Demand from the Electric Power Sector," February 2015.

to rely upon mechanisms that facilitate emission trading between affected power plants in different states. Doing so will increase flexibility of the system, mitigate many electric system reliability concerns, and lower the overall cost of compliance for all.[6]

In this report we identify a number of actions that the Federal Energy Regulatory Commission (FERC), grid operators, states, and others should take to support electric system reliability as the electric industry transitions to a lower-carbon future. We summarize our recommendations for these various parties in tables at the end of our report.

In the end, the industry, its regulators and the States are responsible for ensuring electric system reliability while reducing carbon emissions from power plants as required by law. These responsibilities are compatible, and need not be in tension as long as all parties act in a timely way and use the many reliability tools at their disposal.

We observe that, too often, commenters make assertions about reliability challenges that really end up being about cost impacts. Although costs matter in this context, we think it is important to separate reliability considerations from cost issues in order to avoid distracting attention from the actions necessary (and feasible) to keep the lights on. There may be "lower cost" options that reduce emissions some part of the way toward the target reductions, but that fail to meet acceptable reliability standards. We do not view such 'solutions' as the lowest cost solution precisely because they fail to account for the cost of unacceptable system outages to electricity consumers.

Any plan that starts with consumer costs and works backward to reliability and then to emission reduction is one that fails to consider the wide availability of current tools that have served grid operators for more than a decade to meet reliability needs. There is no reason to think that cost and reliability objectives cannot be harmonized within a plan to reduce carbon pollution.

[6] As we will discuss in a series of regional reports, others have already identified that regional strategies will minimize overall compliance costs. For example, the Midcontinent Independent System Coordinator (MISO) estimated that a regional carbon constraint approach could save up to $3 billion annually relative to a sub-regional or individual state approach. MISO, "Analysis of EPA's Proposal to Reduce CO_2 Emissions from Existing Electric Generating Units," November 2014. See also, "Statement of Michael J. Kormos, Executive Vice President – Operations, PJM Interconnection, FERC Docket No. AD15-4-000, Technical Conference on Environmental Regulations and Electric Reliability, Wholesale Electricity Markets, and Energy Infrastructure," February 19, 2015.

This paper is designed to:

- Describe the changes underway in the industry which set the stage for the continued evolution of reliability tools and practices;
- Provide a "reliability 101" primer to describe what "electric reliability" means to system planners and operators, and why specific standard practices are so important to assuring electric reliability;[7]
- Summarize reliability concerns expressed by various stakeholders;
- Explain the ways that standard operating procedures can address these concerns; and,
- Recommend actions that can be taken by various actors in the electric industry to assure that the Clean Power Plan's goals do not undermine reliable power supply.

Our recommendations can be found in tables following the Executive Summary.

[7] This report also includes a glossary of acronyms used in our report.

Recommendation Tables

Table 1
Key Players in the Clean Power Plan and Available Tools

Entities	Roles and Responsibilities
Entities with direct responsibility for electric system reliability	- FERC (under the Federal Power Act (FPA)) - NERC (as the FERC-approved Electric Reliability Organization under the FPA) - Regional Reliability Organizations (RROs) - System operators and balancing authorities (including Regional Transmission Organizations (RTOs) and electric utilities) - States (for resource adequacy)

Other public agencies with direct and indirect roles in the Clean Power Plan	- U.S. Environmental Protection Agency (EPA)
	- State executive branch agencies:
	    - Air offices and other Environmental Agencies
	    - Public Utility Commissions (PUCs)
	    - Energy Offices
	    - Public authorities (e.g., state power authorities)
	- State governors and legislatures
	- U.S. Department of Energy (DOE)
	- Energy Information Administration (EIA)

Owners of existing power plants covered by 111(d) of the Clean Air Act	- Electric utilities
	    - investor-owned utilities
	    - municipal utilities
	    - electric cooperatives
	    - joint action agencies
	- Non-utility power plant owners

Markets and Resource Planning/ Procurement Organizations	- Organized markets administered by RTOs (CAISO, ERCOT, ISO-NE, MISO, NYISO, PJM, SPP).
	- Electric utilities with supply obligations & subject to least-cost planning processes:
	    - Many utilities (including joint action agencies) operate under requirements to use a combination of planning and competitive procurements (with or without self-build opportunities
	    - Transmission owners also have transmission planning requirements
	- Private investors (including non-utility companies) responding to market signals and seeking to develop/permit/construct/install/operate new resources (including new power plant projects, demand-response companies, merchant transmission companies, rooftop solar PV installation companies, etc.)

Others	- North American Energy Standards Board (NAESB) for setting electric & gas standards - Administrators/Operators of CO_2 allowance-trading systems - Administrators/Operators of energy efficiency programs - Fuel supply and delivery companies (gas pipeline and/or storage companies; gas producers; coal producers; coal transporters) - Energy marketing companies - Emerging technology providers – including, e.g., storage system providers, companies providing advanced communications and "smart" equipment, etc.

Table 2
FERC, NERC, and RROs' Potential Actions to Address Reliability Issues

Electric Reliability Entities (with some of the their Standard Tools)	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)
FERC: - Adoption of federally-enforceable reliability requirements and standards - Oversight of NERC and all bulk power system operators - Oversight of interstate natural gas pipeline owners/operators, with authority to approve interstate pipeline expansions - Authority over transmission planning, tariffs, open-access - In organized markets, authority over market rules (including capacity markets, provision of ancillary services providing various attributes to system operators) - Interagency coordination with EPA, DOE	Consider: - Requiring NERC, RROs, and system operators/balancing authorities to periodically assess potential reliability impacts of CPP with geographic scope appropriate to the reliability entity. The assessments could identify specific concerns, and develop backstop solutions – Preliminary assessments starting at end of 2015/early 2016, to inform state action taking into account known policy, practices, resources in the relevant area – Reliability assessments at the time of proposed state plans – Reliability assessments annually up through early 2020s - Continuing to evaluate the adequacy of current FERC gas/electric coordination policies in light of *incremental* changes resulting from CPP relative to trends already underway in the industry - Eliciting filings from RTOs and other transmission companies about any new planning tools, notice provisions for potential retirements, information reporting, new products, minimum levels of capability with various attributes - Inquiring into new natural gas policies to support wider interdependence with electric system reliability (e.g., incentives for development of gas delivery/storage infrastructure) - Working with states to consider mechanisms to afford bulk-power system grid operators' greater visibility into generating and demand-side resources on the distribution system - Providing guidance outlining compliance strategies that would require approvals of the FERC under the FPA (versus approaches that might not require such)
NERC – Reliability Standards, compliance assessment, and enforcement – Annual & seasonal reliability assessments – Special reliability assessments	Consider: – Continuing to conduct special assessments of impact of CPP on reliability (as it periodically does for other developments in the industry) – Preliminary assessments in parallel with final rule development,(in 2015) and development of State Plans (2015/2016) – Final assessments upon finalization of State Plans (2016+) – Assess whether any new standards relating to Essential Reliability Services need to be modified in light of electric system changes occurring as part of the industry's response(s) to CPP
Regional Reliability Organizations – Annual & seasonal reliability assessments – Special reliability assessments – Coordination with neighboring RROs	Consider: – Conducting special assessments of impact of CPP on reliability – Preliminary assessments in parallel with final rule development,(in 2015) and development of State Plans (2015/2016) – Final assessments upon finalization of State Plans (2016+)

Table 3
Grid Operators' Potential Actions to Address Reliability Issues

Electric Reliability Entities (with some of the their Standard Tools)	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)

System Operators and Balancing Authorities
– On-going annual & seasonal reliability assessments, including transmission planning
– Special reliability assessments
– Coordination with neighboring systems
 	
Note: Some of these entities also fulfill market, resource planning and procurement functions (described further below)
	Consider
	– Conducting special assessments of impact of CPP on system reliability
	  – Preliminary assessments in parallel with final rule development (in 2015) and development of State Plans (2015/2016)
	  – Final assessments upon finalization of State Plans (2016+)
	– Identifying specific areas of concern (e.g., notice period for potential unit retirements; need for more routine anticipatory analyses in transmission planning to explore "what if" changes occur on the system; identification of zones with violations of reliability requirements and any specific units needed for reliability pending resolution of the violation)
	– Working with stakeholders (including environmental agencies in relevant states) to develop proposals for reliability safety value to ensure mechanism to fully offset CO_2 emission impacts when use of a safety valve is triggered
	– Working with counterparts in natural gas industry to harmonize business practices, develop improved inter-industry forecasting tools, coordinate operating days/market timing, share information, identify specific natural gas infrastructure needs
	– Refreshing policies and practices to assure technology-neutral and competitively neutral means for providing reliability services (both resource adequacy and system operations)
	  - Technology neutrality should recognize the different attributes needed for essential reliability services, but be supportive of generation, transmission and demand-side solutions for providing such attributes
	– Working with state officials and distribution utilities within their relevant geographies to explore ways to expand the visibility (e.g., through communications and information systems) of the system operator into distribution system resource operations (i.e., distributed variable resources such as solar PV); incorporate into planning activities
	– Continuing to improve meteorological forecasting capabilities

Table 4
Other Federal Agencies' Potential Actions to Address Reliability Issues

Other Public Entities (with some of the their Standard Tools)	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)

EPA
- **Issuing the final Clean Power Plan regulation**
- **Responsibility for finalizing standards for new power plants (Section 111(b))**
- **Responsibility for administering federal air, water, and waste pollution standards**
	Consider:
	- Clarifying acceptable standard market mechanisms that could be used to accomplish emission-reduction and reliability goals in economically efficient ways
	- Providing guidance on allowing one or more forms of a reliability safety valve, *with the condition* that overall emissions over the interim period (e.g., 2020-2029) are equal to or better than the plan without a triggering of the reliability safety valve. Examples might include:
	  - Allowing the reliability safety valve as proposed by the RTO/ISO Council (with the noted CO_2 emissions offset condition)
	  - Requiring/allowing temporary exemptions/modifications of timing/quantity requirements in State Plans
	  - Providing guidance about how states may propose to alter compliance deadlines/requirements where needed for reliability, should such issues arise over time
	- Requiring States to include reliability assessments in final State Plans (not for EPA to review/approve, but rather to ensure that such studies are conducted)

Other federal agencies - **DOE** - **EIA**	**Consider:** - Investigating additional reporting requirements by members of the industry - Conducting studies and analyses that examine physical capabilities of more integrated gas and electric system - Identifying CPP compliance issues as qualifying for DOE Critical Congestion Areas and Congestion Areas of Concern, and/or "national interest electric transmission corridors" under the Energy Policy Act of 2005

Table 5
States' Potential Actions to Address Reliability Issues

Other Public Entities (with some of the their Standard Tools)	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)

States
– Air agency:
  – obligation to submit State Plans to EPA
  – reviewing/approving any modification to air permits of affected generating units
– Executive and legislative responsibility for energy, environmental laws and regulations
– Oversight over regulated electric and natural gas utilities (public utility commissions) – including ratemaking, programs (e.g., energy efficiency), planning and resource procurement
– Coordination with neighboring states
– Engagement in regional planning, operational, and market rules and procedures
– Siting/permitting of electric energy infrastructure and local gas distribution facilities
	Consider:
	– Proactively (i.e., now) engaging with state utilities and state/regional system operators in evaluation of potential CPP reliability impacts, and identification of reliability solutions (including supporting preliminary assessments in parallel with development of State Plans (2015/2016), and final assessments upon finalization of State Plans (2016+))
	– Establishing as part of the State Plan an annual state reliability evaluation, and identification of/commitment to take steps and measures in the future in response to any identified reliability concerns. This could include a framework for allowing compliance waivers and extensions in the early years in the event that reliability issues arise circa 2020, combined with requirements on state and/or compliance entities for provisional CO_2 reductions over transition period to make up for waivers/extensions in early years (e.g., to arrive at same cumulative emissions over the period)
	- Incorporating conditions in air permits to reflect operating limits (e.g., total emissions within an annual period)
	- Creating flexible implementation plans (e.g., mass-based models) and multi-state programs (e.g., regional cap/trade) to mitigate potential reliability impacts and operational flexibility across regions that reflect the normal operations of interconnected electric system
	  - State or regional cap and trade programs
	  - "Bubbling" of requirements across units owned by common owner (e.g., within one state or across states through bilateral state agreements/MOUs)
	– Developing statewide policies and measures for compliance that support reliability (energy-efficiency/renewable energy programs, including measures beyond Investor Owned Utility funded programs), for example:
	  – Clean energy standards
	  – Investment in emerging or early-stage technologies (*e.g.*, storage), public-private partnerships, tax and investment credits
	  – Protocols for counting Energy Performance Savings Contracts in State Plans
	– Reviewing need to modify permitting/siting regulations to accommodate dual-fuel capability of gas-fired power plants
	– Reviewing need to modify administrative or procedural measures to expedite siting, zoning, permitting of needed energy infrastructure (renewables, other power plants, transmission, LNG storage)
	– Instituting new entities (e.g., natural-gas buying authorities) to serve as contracting entity to support long-term commitments that may be necessary for gas system expansion
	– Requiring longer advance notice of power plant retirements

Table 6
Organized Markets' & Electric Utilities Potential Actions to Address Reliability Issues

Entities Involved with Markets, Resource Planning, and Procurements	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)

Wholesale Market Administrators (Generally, Bulk Power System (BPS) Operators in Competitive Market Regions)
– **Markets designed and administered to minimize costs *subject to the constraint* that all reliability requirements of the system are met**
	Consider:
	– Adding technology-neutral and competitively neutral market rules/products to add incentives for new reliability attributes.
	    – Local (zonal/load pocket) capacity and energy market pricing; changes to scarcity pricing
	    – Reliability attributes for system security (greater quantities of spinning or non-spinning reserves; AGC; ramping/load-following; reactive power; on-site fuel; frequency response; black start capability)
	– Establishing or clarifying, where necessary, expectations around unit performance during shortage or scarcity conditions
	– Clarifying how normal dispatch processes incorporate current restrictions on unit operations (including emissions limits, ramping periods, etc.), and how similar operational restrictions (if any) resulting from Clean Power Plan compliance would be incorporated in system operations
	– Establishing or clarifying, where needed, provisions for the creation of reliability must run (RMR) contracts for generators needed for reliability that would otherwise retire – conditioned upon permit restrictions that account for CO_2 emissions offsets
	– Establishing or clarifying, where needed, procedures to minimize duration of RMR contracts through development of utility or market responses (generation, transmission)
	– Identifying any changes in forward capacity markets for the period starting in 2020

Vertically-Integrated Utilities, Cooperatives, Municipal Light Companies
– **Long-term resource planning**
– **Obligation and opportunity to develop and obtain cost recovery for necessary demand, supply, and transmission investments and expenses**
– **Obligation to maintain power system reliability**
– **In some states, integrated resource planning and/or resource need/procurement processes**
– **Coordinated operation of systems with neighboring utilities**
	Consider:
	– Conducting forward-looking assessments of potential impacts on system reliability of CPP implementation
	    – Preliminary assessments prior to and during final rule development and SIP implementation
	    – Final assessments upon finalization of SIP
	– Developing or expanding long-term integrated resource planning processes for timely and practical incorporation of CPP compliance requirements
	– Incorporating all potential short- and long-term measures (supply and demand; generation and transmission) to address significant changes during CPP transition period
	– Engaging in coordination with neighboring utilities around local reliability concerns tied to CPP implementation

Table 7
Other Organizations' Potential Actions to Address Reliability Issues

Other Organizations that have a Role To Play in Assisting in Reliable and Effective Industry Compliance	Potential Additional Actions to Address Reliability Issues Relating Directly or Indirectly to Clean Power Plan (CPP)
Non-Utility Generating Companies	Consider: - Responding to signals in organized wholesale markets and in response to competitive solicitations by electric utilities
Interstate Natural Gas Pipeline Owners/Operators – Coordination among NGP owners/operators – Coordination with BPS operators – Development of new pipeline capacity	Consider: – Improving coordination with system operators – e.g., harmonize standards and practices, coordinate operating days/market timing, share information, etc.
NAESB - Working with industry stakeholders to develop standards for operations in electric and gas industry	Consider: – Periodically convening industry sector discussions about continuing need to harmonize standards in the electric and gas industries
Administrators of Allowance Trading Programs (e.g, RGGI, California, new ones)	Consider: - Establishing new "plug and play" programs that allow states to join with relatively administrative ease
Administrators of Energy Efficiency Programs	Consider: - Establishing products to offer to generating companies to 'purchase' program credits to offset emissions, subject to strict measurement and verification
Energy Service Companies (ESCos)	Consider: - Working with State agencies to develop mechanisms to incorporate energy-savings-performance contracts into State Plans

I. Context

In June 2014, the U.S. Environmental Protection Agency (EPA) issued its proposed Clean Power Plan, designed to reduce carbon dioxide (CO_2) emissions from existing fossil-fuel power plants in the United States. The final rule, which is now anticipated to come out in mid-2015, will require each of the 49 states with covered power plants to prepare and submit plans for how they propose to reduce emissions from the plants in their state. Although the features of the final regulation will undoubtedly change in light of the many comments filed, EPA's current proposal requires states and affected electric generating units (EGUs) to demonstrate progress to reduce emissions starting in 2020, with subsequent reductions thereafter. This new policy will eventually affect over half of the nation's generating capacity and all but the smallest fossil fuel generating units.[8]

In light of the broad scope of the regulation, many stakeholders have raised concerns about whether EPA's proposal will jeopardize the reliability of the electric system. In Washington, in state capitols, in media alerts, in comments filed at the EPA, and elsewhere, many public officials, electric utilities, industry reliability organizations, and others have been demanding

[8] An affected electric generating unit (EGU) is defined broadly, as any boiler, integrated gasification combined cycle (IGCC), or combustion turbine (in either simple cycle or combined cycle configuration) that (1) is capable of combusting at least 250 million Btu per hour; (2) combusts fossil fuel for more than 10 percent of its total annual heat input and (3) sells the greater of 219,000 MWh per year and one-third of its potential electrical output to a utility distribution system (Proposed Rule, Federal Register, Vol. 79, No. 117, June 18, 2014, page 34854). Generating units estimated to be subject to EPA's Clean Power Plan:

SNL Financial (as of 2-2015)	Generating Units Likely to be Directly Covered by Section 111(d)*		Total Grid-Connected Generating Capacity in the U.S. (GW)	111(d) Capacity as Share of Total Capacity (%)
	(# Units)	Summer Capacity (GW)	Summer Capacity (GW)	Summer Capacity (GW)
Coal	922	300	303	99%
Gas	2,137	334	464	72%
Oil	62	17	39	44%
Total Fossil	3,121	651	806	81%
All Capacity			1,151	57%

* Includes all existing or under development steam turbines and combined cycle units greater than 25 MW, and any natural gas combustion turbines with generation greater than 219,000 MWh.
Source: SNL Financial, Power Plant Unit Database.

that the changes introduced by the Clean Power Plan not come at the expense of electric reliability.[9]

For many decades, such cautions have appeared whenever major events – such as major new environmental regulations affecting power plants or structural changes to introduce competition in the electric industry – occur that could affect electric system reliability.[10]

Indeed, well before the EPA issued its proposal, various reliability organizations had already begun to anticipate how changes underway in the electric industry would necessitate modifications in traditional ways to plan for and operate the electric system. For example, the North American Electric Reliability Corporation (NERC) – the nation's electric reliability standards organization – issued a "concept paper" in October 2014, in which NERC describes the many ways that today's reliability procedures will need to evolve to keep ahead of the changing character of the electric "resources" that connect with the grid.[11]

NERC's paper, which was in development well before the EPA issued its Clean Power Plan (and is different from NERC's November 2014 assessment relating to the EPA proposal), begins by recognizing that the

> North American BPS [bulk power system] is experiencing a transformation that could result in significant changes to the way the power grid is planned and operated. These changes include retirements of baseload generating units; increases in natural gas generation; rapid expansion of wind, solar, and commercial solar photovoltaic (PV) integration; and more prominent uses of Demand Response (DR) and distributed generation…. As the overall resource mix changes, all the aspects of the ERSs [Electric Reliability Services] still need to

[9] See discussion in Section III and the Appendix to this paper. Note that even the leadership of the EPA and the President of the United States have insisted upon design and implementation of the Clean Power Plan in ways consistent with electric system reliability. See, for example: President Obama's Presidential Memorandum ("Power Sector Carbon Pollution Standards," June 25, 2013), in which the President directed the EPA to issue regulations to control CO_2 emissions from the power sector, and included the following instructions: "In developing standards, regulations, or guidelines … [EPA] shall ensure, to the greatest extent possible, that you: …(v) ensure that the standards are developed and implemented in a manner consistent with the continued provision of reliable and affordable electric power for consumers and businesses…" Available at: http://www.whitehouse.gov/the-press-office/2013/06/25/presidential-memorandum-power-sector-carbon-pollution-standards

Also, see: Statement of Gina McCarthy, Nominee for the Position of Administrator of the EPA, Before the Environment and Public Works Committee, U.S. Senate, April 11, 2013; and the January 6, 2015 blog post of Janet McCabe, EPA's Acting Assistant Administrator for Air and Radiation, "Time and Flexibility: Keys to Ensuring Reliable, Affordable Electricity," http://blog.epa.gov/epaconnect/2015/01/time-and-flexibility/.

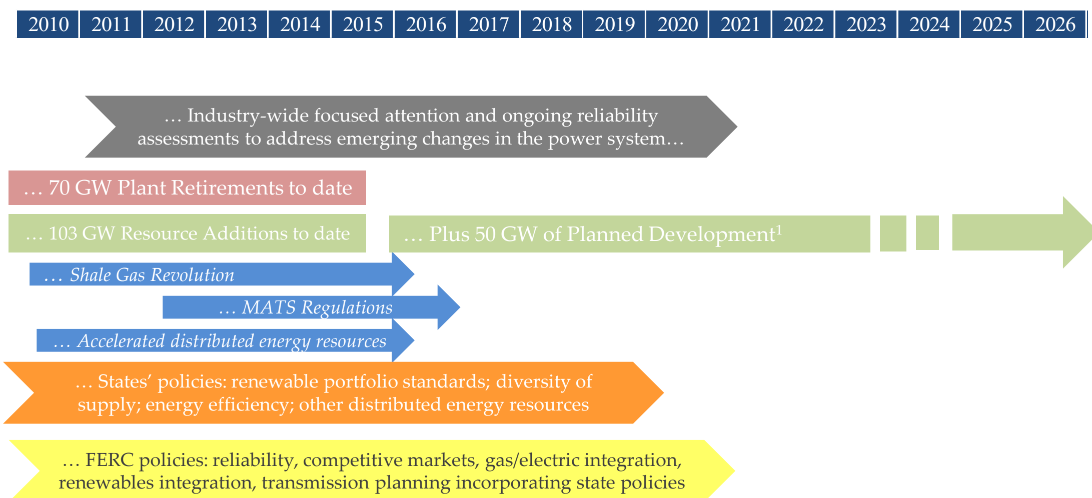
[10] Notably, this has occurred in conjunction with: the EPA "NO_x SIP call" which affected 23 states in the 1990s; state and federal policies related to electric industry restructuring in the 1990s: the Cross-State Air Pollution Rule (CSAPR) and MATS rule; and with on-going increases in the amount of distributed energy resources and intermittent/non-dispatchable resources on the grid.

[11] NERC, "Essential Reliability Services Task Force: A Concept Paper on Essential Reliability Services that Characterizes Bulk Power System Reliability," October 2014. Hereinafter referred to as "NERC Essential Reliability Services Report".

be provided to support reliable operation. ERSs are technology neutral and must be available regardless of the resource mix composition.[12]

Those transformations have been in the works for years – in part as a result of the shale gas revolution, changes in the relative prices of fossil fuels, state policies and federal laws encouraging greater use of renewable energy and energy efficiency, declines in wind and solar technology costs, retirements of old and highly polluting coal plants, retirements of a handful of nuclear plants (in some cases for safety reasons, and others for economic reasons), and strong interest by many customers in exploring ways to better manage their own energy use.[13] We depict these changes occurring in parallel in Figure 1, below.

Figure 1
Timeline of Changes Underway in the Electric Industry



[1] Includes retirements/additions announced for 2015 and units that are mothballed or out of service. Planned units include those under construction or in advanced development. Source for MW of retirements and planned additions: SN Financial, Accessed February 2015

As always, grid operators and utilities have implemented and adjusted long-standing planning and operational practices to stay abreast of, understand, and adapt practices to address reliability issues related to such changes in the industry. Given the multiple pressures on the electric power sector, such actions would be needed today even if EPA had not proposed to control carbon pollution in the Clean Power Plan.

[12] NERC Essential Reliability Services Report, page iii. The scope of work for this report was adopted by NERC in March of 2014, before the EPA Clean Power Plan was issued in proposed form in June, 2014.

[13] See, for example: Susan Tierney, "Greenhouse Gas Emission Reductions From Existing Power Plants Under Section 111(d) of the Clean Air Act: Options to Ensure Electric System Reliability," May 8, 2014, pages 23-46.

Indeed, many organizations besides NERC have also been flagging the need to address reliability issues as the industry undergoes significant change. For example:

- The Federal Energy Regulatory Commission's (FERC) attention to gas-electric coordination as the two industries become increasingly dependent on each other,[14] and transmission companies and Regional Transmission Organizations (RTOs) plan for integration of variable generating resources and transmission requirements driven by public policies of state and local governments;[15]
- Studies by the Midcontinent ISO (MISO) of gas infrastructure,[16] and MISO's support for policies addressing transmission implications of the region's growing quantities of wind and other renewable resources;[17]
- ISO-New England's (ISO-NE) continuing analysis of that region's deepening reliance on gas-fired generating facilities, near-term generator retirements, and need to integrate deepening amounts of renewable resources;[18]

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[14] FERC Commissioner Philip Moeller first requested comments on gas-electric coordination in February 2012. Since that time, the FERC has held nine regional conferences to address the issue. See FERC "Natural Gas – Electric Coordination." Available: http://www.ferc.gov/industries/electric/indus-act/electric-coord.asp for additional detail. In 2013, FERC Chairman Cheryl LaFleur and Commissioner Moeller testified before Congress on "The Role of Regulators and Grid Operators in Meeting Natural Gas and Electric Coordination Challenges". The Commissioners noted that gas-electric coordination was and is a growing and important trend due to falling natural gas prices and substantial domestic supplies. FERC receives quarterly updates from its staff on the status of developments in the industry regarding gas/electric coordination issues. http://www.ferc.gov/industries/electric/indus-act/electric-coord.asp. Note too that in response to a directive from FERC, the North American Energy Standards Board (NAESB) undertook a process to develop some new standards for both electric and natural gas industries, which were described in a report submitted to FERC on September 29, 2014.

[15] On July 21, 2011, FERC issued Order 1000 (Docket No. RM10-23-000), in which the agency required, among other things, that each public utility transmission provider: (1) participate in a regional transmission planning process that produces a regional transmission plan; and (2) consider transmission needs driven by public policy requirements established by state or federal laws or regulations. Each public utility transmission provider must establish procedures to identify transmission needs driven by public policy requirements and evaluate proposed solutions to those transmission needs. FERC Fact Sheet, Order 1000, http://www.ferc.gov/media/news-releases/2011/2011-3/07-21-11-E-6-factsheet.pdf. On June 22, 2012, FERC issued the final rule in its docket (RM10-11-000) on Integration of Variable Energy Resources, in which it ordered a number of changes in interconnection agreements, transmission tariffs and cost recovery for regulation reserves to better accommodate renewables reliably and efficiently. 139 FERC ¶ 61,246, FERC Order No. 764.

[16] MISO released its first gas-electric interdependence study in February 2012; it reviewed existing gas pipeline capacity to serve existing electric generation and additional capacity that could be added in the future, and signaled to the MISO and stakeholders that an increase in gas-fired generation will require an "improved collaborative process between pipelines, power generators, and regulators to coordinate natural gas infrastructure projects." Gregory L. Peters, "Gas and Electric Infrastructure Interdependency Analysis," Prepared for the Midwest Independent Transmission System Operator, February 22, 2012, page. 12.

[17] MISO's "Multi-Value Project Portfolio Analysis" of transmission projects will support delivery of up to 41 million MWh of wind energy. Available: https://www.misoenergy.org/PLANNING/TRANSMISSIONEXPANSIONPLANNING/Pages/MVPAnalysis.aspx

[18] ISO-NE first identified these issues in 2010. In 2013, ISO-NE's Chief Executive Officer, Gordon van Welie, stated: "It is clear that resolving these challenges will not be simple, and it will take several years to realize the benefits of the solutions… It is important to remember that, often, the best ideas are born out of necessity. Today the power system faces significant and formidable obstacles. But tomorrow, it will be smarter, stronger, and more environmentally sound because of our collective efforts." ISO-NE, "2013 Regional Electricity Outlook," January 31, 2013, page 8.

- Starting in 2010, calls by the American Public Power Association (APPA) to pay greater attention to the impacts of distributed generation and increased natural gas demand for power generation;[19]
- The Electric Reliability Council of Texas' (ERCOT) ongoing analysis of wind integration as part of its bi-annual Long Term System Assessment;[20]
- The review by the five major electric utilities in California of the implications of a potential significant increase in the state's renewable portfolio standard,[21] and the California ISO's (CAISO) solicitation of more flexible resources to support integration of renewables;[22]
- PJM Interconnection's (PJM) recent capacity performance proposal, in response to concerns raised by unavailable conventional generation capacity during the 2013-2014 polar vortex;[23] and
- New York ISO's (NYISO) ongoing evaluation of reliability needs, including scenarios that account for environmental regulations, increasing penetration of renewable resources, and natural gas fuel availability.[24]

These studies and activities – and others like them – illustrate that our electric system operators, planners, regulators, and others are stepping up to the plate (as they typically do) to grapple with ways to make sure that the future electric system is as reliable as the one we count on today. And their analyses reflect the reality that these trends are occurring as a result of economic, policy and regulatory forces that are independent of EPA's Clean Power Plan.

The value of such "reliability alerts" is that they identify ways in which changes in policy, economics, technology, and law affecting the electric industry intersect with the physics and engineering of interconnected electric systems. All parts of the system must pay attention to certain imperatives of the others.

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[19] See, for example, Aspen Environmental Group, "Implications of Greater Reliance on Natural Gas for Electricity Generation," prepared for American Public Power Association, July 2010.; and American Public Power Association, "Distributed Generation: An Overview of Recent Policy and Market Developments", November 2013.

[20] See, for example, ERCOT, "Long-Term System Assessment for the ERCOT Region," December 2012, which examined the implications of introducing significant wind generation and new gas-fired power plants on to the ERCOT Texas system.

[21] Energy+Environmental Economics, "Investigating a Higher Renewables Portfolio Standard in California," January 2014.

[22] California Independent System Operator Corporation Reply Comments on Workshop issues, before the Public Utilities Commission of the State of California, In the Matter of "Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local Procurement Obligations." Rulemaking 11-10-023, April 5, 2013.

[23] PJM Staff Proposal, "PJM Capacity Performance Proposal", August 20, 2014.

[24] NYISO conducts a detailed "Reliability Needs Assessment" every two years. See, for example, NYISO, "2014 Reliability Needs Assessment," Final Report, September 16, 2014.

Certainly, the shale gas 'revolution' has introduced significant quantities of domestically supplied natural gas at prices which compete with coal, the historically dominant domestic fossil fuel for power generation. This new reality presents economic opportunities to the power system, with cost and environmental benefits for households and businesses. At the same time, however, lower-cost natural gas introduces new issues that must be addressed in the standards, business practices and regulation of both the electric and gas industries: for example, there are new issues surrounding ensuring adequate fuel-transportation and storage arrangements. States' policies to rely more heavily on domestic wind and solar generation also introduce new challenges: grid operators must plan to operate their systems reliably with greater reliance on less dispatchable resources (or in some cases resources that cannot be 'seen' on the system by grid operators, when the resources are behind the meters of customers).

Reliability organizations and grid operators (including NERC, Regional Transmission Organizations (RTOs), electric utilities, and others) are already facing the implications of these trends. They are doing what we count on them to do: looking ahead to see what's on the horizon and identifying reliability-related issues that require adjustments to planning, markets, or operations. They are identifying issues that arise from economic, technological, legal or policy changes. They are developing new analytic tools to better understand how factors like the weather (or wind or sun/cloud-cover conditions) affect power system operations. They are identifying possible, if not likely, changes in power supplies, and indicating where and when new resources might be needed in the years ahead. They are working with transmission owners, power plant companies, government regulators, reliability coordination organizations, consumer representatives, and others to identify changes that may be required in operating standards, market products, and practices.

This is standard operating procedure in an industry with a history with strong legal, cultural, and organizational incentives to do what it takes to make sure that a world-class reliable electric system remains a bedrock of the American economy and society. Recent calls for action to ensure that the Clean Power Plan does not jeopardize electric system reliability should be viewed in that context: people are doing their jobs, not necessarily trying to impede the Clean Power Plan.

II. What Do We Mean by "Electric System Reliability"?

What is reliability, and why does it matter?

http://www.dailymail.co.uk/news/article-2226399/Sandy-Vast-majority-ConEd-wont-power-10-days--Manhattan-hopes-lit-Saturday.html

Most electricity users think of reliability in terms of how often their power shuts off and how long it takes to get it back on. These familiar reliability annoyances typically result from events affecting the local distribution system, such as a snowstorm or hurricane knocking out power lines or a car hitting a power pole.

While critically important to electricity users,[25] such events are not the main concern of observers considering the implications of EPA's Clean Power Plan. What they worry about is whether the overall electric system can do its job, day in and day out, even if one neighborhood or another loses its power.

This other kind of reliability is known as "bulk power system"[26] reliability (and what we call "system reliability" and what insiders sometimes call "BPS" reliability). Outages due to system failures differ from local outages in fundamental ways: in how they can arise; in the geographic scope of power interruptions; in the process and timing of power restoration; in the magnitude of adverse consequences; and, in terms of the parties responsible to fix the problems. The sheer scale of potential human health, safety, and economic impacts is what separates system reliability from local reliability, and dictates a high degree of vigilance on the part of regulators and the industry to avoid system-reliability failures.[27]

[25] Electricity consumers are acutely aware of how inconvenient and costly outages can become, and of course may not care whether an outage is local or system-wide, in terms of the disruptive impacts on their lives. At the state level, maintaining reliable service is a fundamental obligation of every local utility, and state public utility commissions (PUCs) measure the performance of local utilities in maintaining local reliability over time through measurements that track the frequency and duration of outages. In many states, utilities can be fined heavily for poor reliability performance tied to local distribution-system outages. In contrast, system power failures – which are far less common – generally involve events affecting power plants and transmission lines and a wider geographic area of the grid, with reliability enforcement subject to the jurisdiction of FERC under then Federal Power Act (FPA).

[26] A Bulk Power System (BPS) generally covers a wide geographic region, and includes the generating resources, transmission lines, and associated equipment and systems used to operate the integrated electric system within the region. BPSs generally do not include the lower-voltage distribution systems of local utilities, which deliver power from the BPS to end-use customers.

[27] This is not to say that local distribution system circumstances can never create system reliability challenges. Given that the electric system has to maintain customer demand (load) and supply in balance at all times, a major storm that causes local lines to

For this reason, multiple entities (including those in Table 8) constantly monitor conditions on the overall power system to assure that the overall system operates with a high degree of reliability. System planners, reliability organizations, power companies and regulators look many years ahead, to analyze changing conditions and flag issues on the horizon that need attention. From one season to the next, they review whether there will be enough resources to meet peak demand. Closer to real time, system operators monitor whether power plants are out for maintenance, whether temperature conditions will produce higher than expected demand, and myriad other conditions so that they can get ready for the next day's operations. And in real time, on a second-by-second basis, grid operators have to monitor, and manage the "balance" of the system so that supply equals demand within tolerable operating limits (i.e., "frequency"). Thus, across very different time frames, many actors in the industry work to assure that the system performs with impeccable reliability levels.

Table 8
Entities Responsible for Electric System Reliability

Organization	Roles and Responsibilities
Federal Energy Regulatory Commission (FERC)	- Federal agency responsible for enforcement of electric sector reliability requirements, including oversight of the ERO (NERC)
North American Electric Reliability Corporation (NERC)	- Designated as the Electric Reliability Organization (ERO) by FERC; responsible for developing, assessing and enforcing reliability standards
Regional Reliability Organizations (RROs)	- Members of the NERC that ensure regional operations are reliable, adequate and secure. Includes: Florida Reliability Coordinating Council (FRCC), Midwest Reliability Organization (MRO), Northeast Power Coordinating Council (NPCC), Reliability First (RF), SERC, Southwest Power Pool (SPP), Texas Reliability Entity (TRE), and Western Electric Coordinating Council (WECC)
Grid and System Operators, and Balancing Authorities	- Responsible for the reliability functions in specific geographic areas. In addition to many electric utilities, there are other organizations serving this function in wide geographic areas, including Regional Transmission Organizations (the New York System Operator (NYISO), PJM Interconnection, New England Independent System Operator (ISONE), Midcontinent Independent System Operator (MISO), California Independent System Operator (CAISO), and Electric Reliability Council of Texas (ERCOT)

Those responsible range from: the federal regulators at the FERC, which has statutory authority relating to system reliability; to NERC, the nation's "Electric Reliability Organization" (ERO), authorized by FERC to set reliability standards for grid operators, utilities and other power companies; to Regional Reliability Organizations (RRO) which ensure that the system is reliable, adequate and secure within the geographic footprint for which they're responsible; to grid operators (also known as "balancing authorities" or "system operators") with the operational responsibility in smaller areas.[28] Each

go down can cause a rapid loss of demand with the immediate need to address that big imbalance on the overall system in order to avoid a bigger problem affecting many other areas of the grid. Similarly, high penetrations of distributed resources (e.g., rooftop solar panels on customers' premises) connected to the local distribution system are emerging as a reason to increase the BPS grid operator's "visibility" into what is happening at the distribution system level because of the interrelationships between the two systems. In fact, several areas with significant current or expected installation of distributed resources (e.g., Hawaii, California) have begun to evaluate potential system-wide challenges associated with such developments.

[28] NERC's Glossary of Terms formally defines the various entities, along with various terminologies that described their responsibilities. NERC, "Glossary of Terms Used in NERC Reliability Standards," January 29, 2015, available: http://www.nerc.com/pa/stand/glossary%20of%20terms/glossary_of_terms.pdf

one has different responsibilities, as shown in Table 8.

These entities monitor system reliability using time-tested, well-developed industry analytic tools. For longer-term assessments, the standard methods take into consideration a vast array of potential future infrastructure scenarios and system operational contingencies (e.g., sudden loss of generation, transmission or load). Annually and seasonally, system operators and reliability planners conduct reliability assessments to evaluate system changes, flag areas of concern that need to be addressed within different time frames, and identify plans to address any reliability concerns that may arise over the planning period. In addition, special assessments are periodically carried out in response to any industry or policy changes that have the potential to affect system reliability.

Thus it should not be surprising that EPA's proposed Clean Power Plan is being (and will continue to be) evaluated for potential reliability impacts in future years. We have seen such reliability evaluations exercised regularly over decades in the face of other major industry changes, as noted previously.[29] In every case, the prospect of change has led to reliability assessments and the waving of cautionary flags to call attention to the new challenges ahead.

How could electric system reliability be affected by the Clean Power Plan?

The Clean Power Plan will not lead to more cars hitting distribution poles, nor will it affect the frequency, location, or severity of storms that lead to local outages. The more relevant questions are how controls on power plant CO_2 emissions will affect power system components and operations. As highlighted in Section III (which summarizes stakeholder concerns around the Clean Power Plan's potential impacts on system reliability), concerns primarily relate to impacts these pollution controls will have on availability of existing power plants. Will plants

[29] There are many examples where changes in conditions have led to questions about whether the electric industry (and its supply chains) could respond in a sufficiently timely and effective way to avoid reliability problems. This occurred, for example, with: (1) prior EPA and state regulations governing human health and environmental impacts, including the CAA Title IV sulfur dioxide cap-and-trade program contained in the 1990s; the changes in National Ambient Air Quality Standards (NAAQS) and Clean Water Act (CWA) requirements; the more recent CSAPR and MATS regulations; and the proposals under 316(b) of the CWA. (2) Changes to the structure of the electric industry over the past several decades, involving major changes in the regulation of and the incentives for investment and operation; transfers of ownership and management of existing generation and transmission system elements; and the formation of RTOs and associated wholesale markets for energy, capacity and ancillary services. (3) Fundamental shifts in the economics of generating power from coal or from natural gas, driven initially by changes in technology costs (e.g., large-scale steam generators versus combined-cycle technologies) and more recently by the emergence of low-priced domestic shale gas resources; the growing strain in some regions on the capacity of interstate natural gas delivery and storage systems to meet combined demand from heating and electricity generation uses during peak winter conditions; and different business practices, and operational protocols and standards in two industries (the natural gas industry and the electric industry) that might need to be better aligned as the two industries become more interdependent. (4) The ongoing displacement of traditional generation resources by grid-connected and customer-sited variable renewable resources, in some cases dramatically changing the shape of net load that must be followed by system operators. (5) Questions about the ability of some wholesale electricity markets to provide sufficient financial incentives for suppliers to continue to operate and/or to enter the market.

retire and, if so, which ones and when? Which new ones will be added, over what time period? Will gas pipelines and other fuel-delivery infrastructure be in place in time to fuel a power system that depends more upon natural gas? Will the electric transmission system be capable of moving power generated in new locations relative to customer demand?

Insights and answers to these various questions fall into two basic categories, differentiated by time scales. One focuses on long-term planning considerations, and is called "resource adequacy": Will there be enough (adequate) resources in place when system operators need to manage the system to meet demand in the future? The other focuses on short-term operations, and is called "system security": Will the operators be able to run the system in real time in a secure way to keep the system in balance, with all that that entails technically?[30]

Resource Adequacy

First, the interconnected electric grid must have resource adequacy – that is, there must be sufficient electric supply to meet electric demand at the time of annual peak consumption, taking into account the expectation that some parts of the system will not be able to operate for one reason or another. The system must have some additional quantity of capacity above the annual peak load value (the reserve margin) to cover the possibility that in highest-demand hours some resources may be out of service due to planned or unplanned outages.[31] In some regions and sub-regions (or "zones"), constraints on the ability of the transmission system to move power from one location to another mean that some portion of the demand within the zone must be met by generating resources within that same zone.

Ensuring resource adequacy is generally accomplished through two steps. First, the expected system peak demand and energy requirements over a long-term period (e.g., ten years) are established through a comprehensive forecasting effort. Forecasting processes for this purpose use well-established economic and industry modeling tools and data, are conducted frequently, and typically involve input by utilities, grid operators, public officials, consumer advocates, and

[30] The U.S. Energy Information Administration (EIA) defines electric system reliability as the "degree to which the performance of the elements of the electrical system results in power being delivered to consumers within accepted standards and in the amount desired. Reliability encompasses two concepts, adequacy and security. Adequacy implies that there are sufficient generation and transmission resources installed and available to meet projected electrical demand plus reserves for contingencies. Security implies that the system will remain intact operationally (i.e., will have sufficient available operating capacity) even after outages or other equipment failure. The degree of reliability may be measured by the frequency, duration, and magnitude of adverse effects on consumer service." U.S. EIA, "Glossary," available at http://www.eia.gov/tools/glossary/index.cfm?id=E.

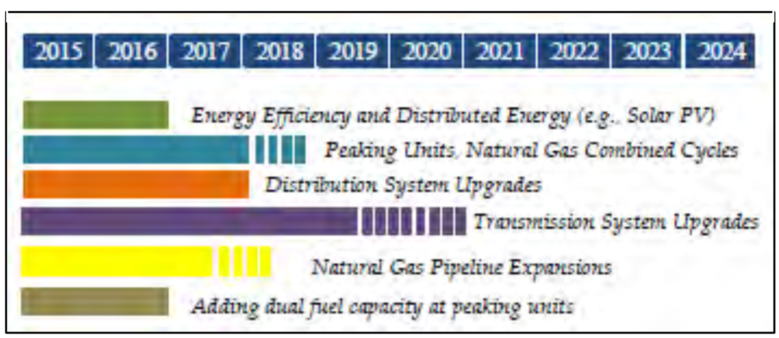
[31] Reserve margins are generally in the range of 10 to 20 percent of system peak load. The actual reserve margin varies from region to region as a function of many factors (e.g., the mix and expected performance of assets on the system, operational and emergency procedures, the availability of demand response/load curtailment, and contributions that may come from neighboring regions).

many other market participants and stakeholders. This step occurs in both wholesale energy markets and through integrated resource planning conducted by electric utilities.

Second, to the extent that identified long-term needs exceed resources expected to be on the system (due, for example, to growth in demand over time, and/or the retirement of existing resources), the deficit is met through the addition of new infrastructure (power plants or transmission lines) and/or demand resources (such as energy efficiency or demand-response measures). The ways in which new resources are added varies around the country, depending on the structure of the electric industry and the regulatory approach in place in a given state, along with other aspects of the market (including FERC-regulated RTOs in many regions). In wholesale market regions like PJM and NYISO, identified needs are met through market structures designed to provide financial incentives for investment in new capacity. In other regions (like most of the West), vertically integrated utilities, cooperatives and municipal electric companies add needed capacity by proposing and building their own project and/or through soliciting offers from other competitive suppliers. In any event, the overall resource need is forecasted (and, if relevant, a local/zonal requirement is further identified), and some combination of regulated and/or market process brings forth proposals to satisfy the need.

These processes are designed to accommodate the lead times necessary to bring a new project or resource into operation. They typically involve sufficient advance notification of need to allow for: (1) initial development stages and associated studies around project feasibility, interconnection, etc.; (2) administration of the markets or competitive procurement processes (and regulatory approvals of them); (3) zoning, permitting, and siting approvals for specific facility projects; (4) construction of the power plant and associated infrastructure (e.g., transmission interconnection/upgrades and – if needed – fuel delivery such as natural gas pipeline connections). Lead times for implementing peaking generating units and demand-side actions (e.g., programs leading to installation of energy efficiency measures; equipping buildings with automated capability to control demand when signaled to do so by the system operator; adding solar PV panels) are much shorter than those for large power plants and transmission upgrades. Figure 2 provides a conceptual depiction of lead times for planning, developing and installing

Figure 2
Typical Lead Times for Different Electric Resources



Source: Analysis Group

different types of infrastructure to support electric resource options.

The processes outlined above rarely occur in a sequential fashion.[32] Ten-year assessments take into account time periods that extend well beyond the number of years it typically takes to develop, permit, finance, and construct a new power plant.[33] As one developer is starting to scope out where to site a new power plant in anticipation of hoping to get approvals and enter the market four years in the future, another already has its approvals and has commenced construction. Installation of demand-response measures take much shorter time periods altogether. Many steps occur concurrently across many different types of resources that are being planned and put in place to meet resource adequacy requirements.

In practice, there are exceptionally few instances where industry has failed to provide for resource adequacy, where – due to a lack of installed capacity – the grid operator had to implement emergency protocols (such as lowering voltage (sometimes known as rolling brownouts) or curtailing service to customers (sometimes known as rolling blackouts)).[34] Although there have been rare occasions where a relatively near-term resource adequacy problem has been identified, regulators, market participants, grid operators, customers and reliability organizations have taken the steps needed to assure that the lights stayed on. There are well-known examples from around the country where the industry (including its regulators) did what was necessary to keep power flowing to consumers.[35] In large part, this track record

[32] For example, often initial market development of a new generating resource – e.g., site identification and control, technology selection, fuel and transmission infrastructure studies, fatal flaw analyses, even some initial siting and permitting efforts – happen in advance of or concurrent with resource need specification or market/utility procurement. Similarly, engineering, construction, and fuel contracts may be established (on a contingent basis) prior to final resource selection or final regulatory approval. Successful resource development teams effectively manage the flow of steps needed to take a new power plant from concept to operation so as to balance the stages of investment risk against the process of procurement and approval.

[33] Typically, lead times for a new natural gas power plant involve 2 years for development and permitting and another 2 years for construction. A peaking unit typically takes less time: from 2 to 3 years. Demand-response and other distributed energy resources can be brought to market in 1 to 2 years. Some generating additions may further require transmission or distribution system upgrades. These can range in time from as little as 2 to 3 years for local distribution upgrades to 5 to 6 years or longer for more extensive transmission system upgrades, but such permitting and construction activities are carried out coincident with power plant permitting and construction. Lead and development times are in part, flexible, depending on the system need and critically, it is possible to move faster when needed. For example, following the California Energy Crisis in the early 2000's, the state added thousands of MWs of new generation using a set of emergency 21-day, 4-month, and 6-month citing procedures. These emergency responses helped establish a set of best practice siting procedures that can be used by other states in similar situations. Susan F. Tierney and Paul J. Hibbard, "Siting Power Plants: Recent Experience in California and Best Practices in Other States," Hewlett Foundation Energy Series, February 2002.

[34] A notable exception is the well-known California electricity crisis of 2000-2001, which resulted from a combination of actions (including market manipulation through actions in the electric and natural gas markets, as well as caps on retail electricity prices). To our knowledge, there has never been a resource adequacy event (e.g., a brownout or blackout) due to implementation of an environmental regulation.

[35] Examples include:

- ERCOT's slim reserve margins in recent summers, including for example, in 2012, when nearly 2,000 MW of mothballed capacity was returned to service. Commissioner Anderson Jr., Public Utilities Commission of Texas, "Resource Adequacy in reflects the existence of the many resource-adequacy processes outlined above, the presence of multiple early warning systems, the ability of policy makers to take action to address challenges when urgent action is needed,[36] and a strong mission orientation of the industry and its regulators.[37]

System Security

Even assuming that these resource adequacy processes end up ensuring there are enough megawatts of capacity in place when needed to meet aggregate load requirements, actual

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ERCOT," Update #4, January 30, 2013. Available: https://www.puc.texas.gov/agency/about/commissioners/anderson/pp/analysis_ercot_capacity_reserve_margin_013013.pdf.

- Reliability must run (RMR) contracts to keep plants operating, for example:
  - The retention of operations of the Potomac Generating Station until completion of the Pepco transmission lines; see, Paul J. Hibbard, Pavel G. Darling, and Susan F. Tierney, "Potomac River Generating Station: Update on Reliability and Environmental Considerations," July 19, 2011);
  - A delay in Exelon's proposed retirement of the Eddystone and Cromby generating stations in Pennsylvania after PJM determined that in the absence of transmission upgrades, retirements of those units would lead to violations of security standards, with a reliability must run agreement between PJM and Exelon and state air regulators so that the plant could remain on line pending those transmission upgrades, but with limits on the units' dispatch to only those times when the units were needed for operational reliability purposes. Prepared Testimony of Kathleen L. Barrón, Vice President of Federal Regulatory Affairs and Policy, Exelon Corporation, before the FERC, Reliability Technical Conference Docket No. AD12-1-000 (etc.), November 11, 2011.
- Construction of peaking units on a fast-track basis by the New York Power Authority: "We increased our generating capacity by about 450 megawatts during summer 2001 when we began operating small, clean natural gas-powered generating plants at six sites in New York City and one on Long Island. We had launched a crash program in late August 2000 to install these PowerNow! plants in response to warnings from officials in the public and private sectors that the New York City metropolitan area could face power shortages in the summer of 2001. Similar warnings were repeated throughout the 10 months it took to obtain, site, design and install the units—a process that normally would require more than two years." New York Power Authority, "Small Clean Power Plants," Available: http://www.nypa.gov/facilities/powernow.htm.
- Requests by ISO-NE for demand-response resources in Connecticut on a fast-track basis: "On December 1, 2003, ISO New England Inc. (ISO-NE) issued a Request for Proposals (RFP) soliciting up to 300 MW of temporary supply and demand resources for Southwest Connecticut (SWCT) for the period 2004 to 2008. The purpose for acquiring these resources was to improve the electric system reliability in SWCT through the summer of 2007, when the 345 kV transmission loop is planned for completion." J.E. Platts, ISO-NE, "Final Report on Evaluation and Selection of Resources in SWCT RFP for Emergency Capability, 2004-2008," October 4, 2004, page iii.
- New York State's contingency planning efforts (including consideration of new transmission projects) to prepare for a possible shutdown of the Indian Point nuclear plant, shutdown as early as 2018, depending on the outcome of its re-licensing with NRC. See the New York Department of Public Service Commission Case No. 12-E-0503, "Proceeding on Motion to Review Generation Retirement Contingency Plans." Available: http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=12-e-0503&submit=Search+by+Case+Number

[36] Susan F. Tierney, and Paul J. Hibbard, "Siting Power Plants: Recent Experience in California and Best Practices in Other States," Hewlett Foundation Energy Series, February 2002.

[37] For example, FERC/EPA processes under the MATS regulation introduced a Reliability Safety Valve and related procedures to ensure that identified reliability challenges could be addressed, while allowing some flexibility with the eventual MATS timeline. As discussed below, the ISO/RTO council has proposed a similar reliability safety valve for the Clean Power Plan and the EPA has also acknowledged potential reliability concerns in its most recent Notice of Data Availability memorandum.

'delivered' reliability also depends on making sure that the system operates in real time with high technical integrity.

System reliability is affected in real time by several things:

- The mix of attributes of the resources on the system – their location, their fuel source, and the operating characteristics of the supply and demand resources;
- The variations in system conditions (e.g., building lights turned on, or a power plant tripping off line unexpectedly, or sudden storm-related outages, or shifts in windiness) that change on a second-to-second, minute-to-minute, hour-to-hour, and day-to-day basis; and
- The system operator's practices and procedures for managing the changing conditions on the system at all times and in all places under that operator's responsibility, to assure that the system stays in balance.

System security describes the ability of the system to meet ever changing system conditions, and to do so with enough redundancy in operational capabilities to manage and recover from a variety of potential system events – or "contingencies" – such as sudden and unexpected loss of generation, transmission, or load.[38] System planners and operator must ensure that the mix of resources on the system is capable of responding in real time to normal load changes and contingency events. This is needed to avoid the catastrophic wide-area failure of the bulk power system – such as a cascading outage covering one or more regions – that can come from unacceptable variations in system voltage and frequency. Blackouts can damage electrical equipment on the grid and on customers' premises, and create wide-ranging safety and health impacts.

To assure system security, the system as a whole must have certain attributes allowing it to provide "essential reliability services," as summarized in Table 9. These include two functional categories:

- *Voltage support*, meaning the ability of system resources to maintain real power across the transmission grid, through the use of reactive power sources such as generators connected to the system, capacitors, reactors, etc. Voltage on the system must be

[38] NERC describes certain features of the bulk power system needed to meet system security requirements – e.g., voltage control, frequency control – as Essential Reliability Services, or ERS. NERC Essential Reliability Services Report.

maintained within an acceptable voltage bandwidth in normal operations and following a contingency on the system.[39]

- *Frequency Management*, meaning the ability of the system to maintain a system frequency within a technical tolerance at all times.[40] Frequency is a function of the match between generation output and load on the system, and requires constant balancing, or following of load by resources that can increase and decrease output instantaneously.

Importantly, system security, or operational reliability, is not a "yes" or "no" condition. To maintain it, system operators use a combination of strategies, tools, procedures, practices, and resources to keep the entire system in balance even as conditions change on a moment to moment basis.[41] The difficulty of this task largely results from several things. First, the

[39] Voltage support is local in nature, can change rapidly, and depends in part on the type and location of generators connected to the transmission system. Typically, voltage control is maintained by system planners and operators. Acceptable power factors for voltage support are maintained, in part, through the use of reactive power devices (or power factor control) that inject or absorb reactive power from the bulk power system. Reactive power can be provided by synchronous thermal generators and through capacitors and other devices, as well as by 'adequately designed' variable energy resources (including wind and solar) and storage technology. Voltage disturbance performance is the ability to maintain voltage support and voltage control after a disturbance event. NERC Essential Reliability Services Report, pages 1, 10-11.

[40] Frequency must typically be maintained within tens of mHz of a 60 Hz target. Higher frequencies indicate greater supply, while lower frequencies typically indicate greater demand. Frequency management includes: (1) Operating reserves, which are used to balance minute to minute differences in load and demand, load following capabilities to respond to intra- and inter-hour changes in load fluctuations, and reserves, which are used to restore system synchronization following generator or transmission outages; (2) Active Power Control, including ramping capability to quickly bring generators online in response to operator needs, often in ten minutes or less; (3) Inertia, or stored rotating energy that is used to arrest declines in frequency following unexpected losses. Historically, inertia has been supplied by large coal-fired generators, although NERC notes that new 'synthetic' inertia is available through the operation of variable energy resources supported by energy storage devices; and (4) Frequency Distribution Performance, which similar to voltage distribution performance, is the ability to maintain operations during and after an unplanned disturbance. NERC Essential Reliability Services Report, pages 3-5, 8-9.

[41] System operators manage voltage and frequency as load changes over time, and in response to contingency events, through the posturing and management of the resources on the system across several time scales:

- On a second-by-second basis through automatic generation control (AGC) systems on resources that will automatically adjust generation up or down in response to system frequency signals.
- On the time scale of minutes through tens of minutes through accessing "spinning reserves," including operating resources with the ability to ramp output up or down quickly, and resources that can connect to the system within several minutes.
- On the timescale of tens of minutes through accessing longer-term reserve resources that can turn on and connect to the system in less than an hour (typically on the order of 15 to 30 minutes).
- On the time scale of hours or days by committing sufficient operating and reserve resources to manage *expected* swings in net system load (that is, system load net of variable resource output). Note that load varies in relatively 'normal' ways over the course of the days, weeks, and months, and is predictable with a relatively high degree of accuracy by system operators. This allows for the commitment and availability of enough system resources to meet reliability objectives. However, the proliferation of distribution-level, behind-the-meter (BTM) generation with variable output (e.g., distributed wind and solar PV) complicates the forecasting of "net load" visible to system operators – that is, the normal variation in load net of variable BTM output that comes and goes with the sun and wind.
- On an as-needed basis for voltage control by adjusting reactive power injected into or absorbed from the system by on-line generators, capacitors, reactors, and system var compensators.

Source: NERC Essential Reliability Services Report, generally.

operator has, in effect, a particular set of assets on the system at any time, which reflects the operational attributes of the various resources on the system at that time. These include things like: power plants with different operating profiles (e.g., start-up time, limits on output under different temperature conditions, availability to fuel supply); transmission systems that allow or limit power flows in various directions; 'smart' controls and communications devices that allow (or not) visibility into and/or management of power flows; demand response; storage systems; and so forth.

Table 9
System Security Needs and "Essential Reliability Services"

Services	Components		Description	Consequences of Failure
Voltage Support	*Voltage Control*		Support system load; maintain transmission system in a secure and stable range	· Loss of Load · Equipment Failure · Cascading Losses
	Voltage Disturbance Performance		Ability to maintain voltage support after a disturbance	
Frequency Management	*Operating Reserves*	Regulation	Minute-to-minute differences between load and resources	· Loss of Generation · Load Shedding · Interconnection Islanding · Overload Transmission Facilities · Damage Equipment and lead to Power System Collapse
		Load Following	Intra- and inter-hour load fluctuations	
		Reserves	Includes Spinning, Non-Spinning, and Supplemental; Used for synchronization and respond to generator or transmission outages in 10 min or greater time frames	
	Inertia		Stored rotating energy; Used to arrest decline in frequency following unexpected losses	
	Frequency Distribution Performance		Ability of a plant to stay operational during disturbances and restore frequency to BPS	
	Active Power Control	Frequency Control	Real-time balance between supply and demand	
		Ramping (Curtailment) Capability	Ability to increase/decrease active power, in response to operator needs. Measured in MW/min basis	

Notes and Sources:
[1] Adapted from NERC (2014) "Essential Reliability Services Task Force: A Concept Paper on Essential Reliability Services that Characterizes Bulk Power System Reliability".
[2] NERC (2014) notes that these Essential Reliability Services are functionally equivalent to the Interconnected Operations Service (IOS) definitions, with Voltage Support covering Reactive Power Supply from Generation Sources and Frequency Support covering Frequency Response, Regulation, Load Following, and Contingency Reserves.
[3] NERC notes that many of these ESRs are already defined as ancillary services in the OATT of many system operators. Ancillary services are "those services necessary to support the transmission of electric power form seller to purchaser", considering reliabilty needs. Therefore, NERC considers ancillary services to be a subset of ESRs.

Second, the operator must maintain frequency and voltage on the system at all times. This means, for example, starting up plants as backup resources ("reserves") to quickly replace another plant that trips off line or dips in its output (e.g., due to changes in wind conditions or power plant failure), or adjusting power output up and down with little notice to meet swings in load.

Third, the operator maintains and draws on a diverse set of operational procedures to manage system performance – such as committing or "posturing" resources that may be needed, allowing minor variations in system voltage, calling on resources from neighboring regions, disconnecting variable generation, signaling to 'demand-response' providers to curtail their loads within short periods of time, and other procedures (including, as a last resort, isolated involuntary disconnection of load – or "rolling blackouts").

Reliability is by nature a technology-neutral concept. That said, not all of a system's resources are equal when it comes to the attributes they provide to system operators to manage system security. Historically, power systems' needs for voltage support, inertia, frequency control, and contingency-response capability have been met through operator actions in conjunction with their commitment of the types of technologies on the system: traditional thermal steam units (e.g., coal, nuclear, oil plants, natural gas and combined heat and power units) providing baseload service around the clock; cycling and load-following technologies (e.g., combined cycle plants operating on natural gas); quick-start fossil-fired peaking plants; and dispatchable hydro power supplies.

As the technologies on the system change – which is happening to different extents in different regions as a result of various forces, with or without the Clean Power Plan (as described above in Section I) – steps are being taken to ensure that the suite of essential reliability services is available to supply the frequency/voltage control and contingency-reserve needs of the system. NERC has characterized the challenge as one of filling gaps in services as they arise or widen over time.

Notably, system planners across the country are dealing constantly – and so far successfully – with the new and emerging reliability challenges from changing technology mixes. For example, the CAISO and California electric utilities have identified the need to add greater ramping capability to handle an increased variability in intra-day loads introduced from increasing amounts of 'variable energy resources' (VERs) necessary to meet increasingly higher renewable portfolio standards.[42] In general, load following is typically accomplished through the dispatch of fast-ramping combustion turbines and natural gas combined cycle (NGCC), although load following can also be met through well-designed and cost-effective storage, optimized energy efficiency programs, demand response, and devices (such as smart inverters) being added to wind farms.

[42] California is on track to meet its renewables portfolio standard target, such that by 2020, 33 percent of its total energy comes from renewable resources. The state is considering whether to adopt a 50-percent goal by 2030. Behind-the-meter solar and wind supplies are projected to significantly decrease net load during the middle of the day, while leaving significant shoulder peaks in the morning and evening, resulting in what is commonly called the "duck curve." A recent analysis found that this will require a significant increase in fast ramping, flexible dispatchable generation resources (along with other technologies, including storage). See Energy+Environmental Economics (E3), "Investigating a Higher Renewables Portfolio Standard in California," January 2014.

III. What Concerns are Commenters Raising About Reliability Issues Associated with EPA's Clean Power Plan?

Summary of comments

To date, the EPA has received more than 3 million comments on the proposed Clean Power Plan. Many comments have raised concerns about electric system reliability. These comments have come from a wide range of stakeholders, including: owners of affected power plants (including vertically integrated utilities, merchant generators, municipal electric utilities, cooperatives); state officials, including public utility commissions, air pollution regulators, energy offices, as well as governors, attorneys general, and consumer advocate offices, and associations representing these various groups of public officials; system operators, regional reliability organizations; trade associations with business, public health, environmental, fossil-fuel supply and delivery organizations; members of the public; and others.[43]

The many comments received on reliability issues reflect the importance of thinking clearly about the potential impacts of the Clean Power Plan on system reliability. We summarize the types of reliability-related comments in Table 10, below, and provide more information about these public comments in the Appendix. Notably, EPA has made it clear that system reliability needs to be maintained as the Clean Power Plan is finalized and implemented.[44]

[43] Among the latter include various electric industry organizations (e.g., the Edison Electric Institute; the APPA; the National Rule Electric Cooperative Association; the Electric Power Supply Organization; the Clean Energy Group); business associations (e.g., the Chamber of Commerce); gas industry organizations (e.g., the Interstate Natural Gas Association (INGAA)); coal-industry groups (e.g., the Coal Utilization Research Council); non-energy trade groups (e.g., Water Associations such as the American Water Works Association, National Association of Water Companies and the National Association of Clean Water Agencies), and environmental organizations (e.g. Natural Resources Defense Council and Environmental Defense Fund); NERC; various individual RTOs (MISO, PJM, NYISO); FERC Commissioner Philip Moeller; Senator Dan Coats and 22 other senators. This is not intended to be a comprehensive or exhaustive list of comments or commenters, but rather represent the broad cross-section of types of organizations with an interest in Clean Power Plan reliability issues. Regulations.gov Docket Folder Summary, Docket No. EPA-HQ-OAR-2013-0602, "Standards of Performance for Greenhouse Gas Emissions from Existing Sources: Electric Utility Generating Units," available at http://www.regulations.gov/#!docketDetail;rpp=100;so=DESC;sb=docId;po=0;D=EPA-HQ-OAR-2013-0602.

[44] For example, see both the Proposed Rule, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, Federal Register, Vol. 79, No. 117, June 18, 2014. Available at: http://www.gpo.gov/fdsys/pkg/FR-2014-06-18/pdf/2014-13726.pdf, and the Technical Support Document: Resource Adequacy and Reliability Analysis. Available at: http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-resource-adequacy-and-reliability-analysis

Table 10
Summary of Reliability Concerns Raised in Public Comments and Which Need to be Addressed as the EPA's Proposed Clean Power Plan is Implemented

Summary of Comments Submitted on Reliability Issues Related to the EPA Clean Power Plan		
Category	**Description**	**Potential Reliability Considerations – Which Need to be Addressed**
Resource Adequacy	Retirements of baseload power plants are presenting on-going challenges in some regions	May tighten planning reserve margins in some regions and require timely replacement of capacity on a 1-to-1 basis
		Requires additional transmission planning and analyses, with transmission solutions typically having longer lead times (~10 years) than generation additions
Resource Mix and Operational Security	Retirement of coal-fired capacity and restrictions on output at coal plants, combined with greater use of gas-fired capacity, will result in less fuel diversity in various regions	Some coal units will/may be cycled more frequently, ending up with lower overall capacity factors and adversely impacting relevant heat rates (and emissions per MWh)
		Operating gas plants at higher output will depend upon having adequate gas delivery capability, including firm supply and delivery contracts
		Increased reliance on variable and non-dispatchable resources (like wind and solar) will mean the need for greater quantities of operating reserves and ramping capability
		Loss of baseload generation requires additional voltage and frequency Support, including Inertia
Planning and Regulatory Coordination	The interim goals established in the Clean Power Plan do not provide adequate time for planning and development of adequate resources, for state and regional coordination, or for market solutions	Lead times for new transmission and power plants (including planning, siting, permitting, and construction time lines) extend beyond 2020 and the interim deadlines)
		Successful resolution of various gas-electric coordination issues will be needed to support greater reliance on natural gas in many regions
		RTO/ISO rules and practices regarding security-constrained economic dispatch may need to be reviewed and/or updated, depending upon how states design their plans to incorporate emissions controls
		Greater reliance on demand response and energy efficiency may require new rules and forecasting capabilities in wholesale energy and capacity markets
		Allocation (or reassignment) of transmission rights may be needed to accommodate changing power flows following power plant retirements or to accommodate greater reliance on underutilized gas-fired capacity and/or renewable resources.
Market Impacts and Market Responses	Uncertainty surrounding final regulations and state plans make it hard for markets to respond with concrete proposals in timely fashion	Uncertainty surrounding the regulatory treatment of new gas-fired combined cycles (under 111(b)) may chill development
		Increased reliance on gas-fired power plants may depend upon new investment in pipeline capacity, with need for new mechanisms to support long-term commitments in some regions (e.g., organized markets)
		Increased reliance on natural gas may accelerate retirements of nuclear units prior to the end of their operating licenses.
		Reliability must-run contracts may be needed to retain some units needed for reliability, but with potential adverse impacts on wholesale market efficiency
		Uncertainty surrounding how states will plan for ensuring new capacity additions in regional organized markets, in light of buyer-side mitigation and other federal wholesale market rules

Many observers' concerns that the Clean Power Plan could jeopardize *resource adequacy* are tied primarily to questions around timing: Does the sequence of steps implied by EPA's proposal – starting with the June 2014 proposal, then taking into account the timing of EPA's final rule, the development of State Plans, the approval of plans by the EPA, and then through compliance decisions and actions by owners of affected power plants – allow sufficient time for everything that needs to be done by states, reliability planners, grid operators, planning and procurement processes, market responses, and so forth to ensure resource adequacy? Or, where that is not assured, do the final EPA and state compliance provisions and administrative procedures allow sufficient flexibility to ensure proper administration of Clean Power Plan without jeopardizing resource adequacy?

Concerns voiced about whether Clean Power Plan implementation could jeopardize *system security* are tied primarily to anxiety over how and when state compliance activity will alter the diversity of resources on the system, and thus the mix of resource capabilities needed to meet system security requirements. In particular, will the economic signals and compliance obligations provided through state implementation of the Clean Power Plan cause the retirement of resources that are needed for system security, and/or will replacement capacity provide the needed operational capabilities? If a significant portion of existing coal-fired capacity retires and is replaced (in part) by gas-fired capacity, will regional interstate pipeline systems be robust enough to ensure reliable delivery of fuel in all hours of the year? If state compliance activities significantly increase the proliferation of grid- and distribution-level variable resources, how much more difficult will it be for system operators to manage the variability in net load on a real-time basis? Or, where this is not assured, do the final EPA and state compliance provisions and administrative procedures allow sufficient flexibility to ensure proper administration of Clean Power Plan without jeopardizing system security concerns?

Other commenters portray the readiness of the industry to step up with solutions to these reliability issues. For example, INGAA described the capability of the natural gas pipeline industry to add new infrastructure.[45] Calpine stated its readiness (along with other market participants) to add new gas-fired generation (and to offer under-utilized capacity already existing on the system).[46] The Clean Energy Group provided suggestions about how the design of policies supporting flexibility and market-based approaches can substantially mitigate reliability concerns.[47] State energy offices (through their national association (NASEO)) noted the ability of a wide variety of well-tested energy efficiency measures (beyond utility-provided programs) to avoid CO_2 emissions from power plant operations.[48] The National Association of Regulatory Commissioners (NARUC) pointed to the ability to reap cost-effective savings in the

[45] Comments of INGAA, filed December 1, 2014.

[46] Comments of Calpine Corporation, filed November 26, 2014.

[47] Comments of the Clean Energy Group (CEG), filed December 1, 2014.

[48] Comments of the National Association of State Energy Officials (NASEO), filed December 1, 2014.

electricity used for water treatment and delivery by introducing measures on the water utility system – thus affording water savings and avoiding CO_2 emissions on the power system.[49]

We also point out many ways to address the reliability issues raised in comments in Section IV of our report, with our suggestions organized around the different entities with some direct or indirect role to play in system reliability.

Reliability safety value concept

The ISO/RTO Council (IRC) has proposed that EPA include a "Reliability Safety Valve" provision as part of the final rule, to help with resolve multi-state issues that may arise due to the Proposed Rule and impact grid reliability.[50] In the view of the IRC, a Reliability Safety Value would provide a regulated and reviewed backstop solution with a defined process for modifying State Plans to ensure reliability against unforeseen issues. As part of this process, the IRC has recommended that the EPA include a specific requirement in the final rule that State Plans must include a detailed reliability assessment. By requiring reliability assessments ahead of final plans, according to the IRC, the Reliability Safety Valve would only be used in situations that could not be addressed ahead of time and that arise solely from dynamic, unplanned changes in the grid. As proposed by the IRC, a Reliability Safety Value would allow relief from compliance schedules if specific units are deemed necessary for reliability considerations.[51] The Reliability Safety Value has been supported by numerous organizations and RTOs, who point out that the concept has been successfully implemented as part of the MATS compliance policy.

We note – as an important element in considering the particular Reliability Safety Valve proposed by the IRC – that there are key differences between the regulatory frameworks of Clean Power Plan and the MATS rule. In particular, the latter assigns emissions-reductions targets on each affected fossil-fuel generating unit, and does not allow any emission averaging across generating stations or across time. As we noted previously in this report, there is much more flexibility in the design of the Clean Power Plan.[52] In particular, the opportunity for states

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[49] Comments of the National Association of Regulatory Utility Commissioners (NARUC), filed November 19, 2014.

[50] For example, see comments filed by the ISO/RTO Council (IRC), December 1, 2014.

[51] This process is analogous to RMR contracts that are often available in organized ISO/RTO markets. These contracts provide for time-limited, out-of-market payments to generators that have provided notification of retirement but are necessary for reliability reasons (e.g., local voltage support). Once alternative resources (transmission or generation) solving the reliability need are in place, the RMR contracts cease and the units may retire. By way of example, the IRC suggests that the Reliability Safety Value and a mandatory reliability assessment could help identify reliability issues arising from an individual State Plan, such as a state requirement for reduced utilization at a fossil unit needed for transmission security and voltage support on a transmission network that crosses a state line. ISO/RTC Comments, filed December 1, 2014.

[52] EPA is relying on a portion of the Clean Air Act– Section 111(d) – in its Clean Power Plan. "Section 111(d)'s regulatory framework creates an entirely different and potentially much wider set of compliance and implementation options compared to

to rely upon market-based mechanisms that allow emission trading across power plants within states and across wide regions is a compelling basis for thinking differently about the need for a reliability safety value in this instance. The wider the region in which emission trading might occur, the less likely that reliability issues will be introduced by the Clean Power Plan.

NERC's initial reliability assessment of the Clean Power Plan

NERC published its own "Initial Reliability Review" of the Proposed Rule in November 2014.[53] NERC flagged a number of "significant reliability challenge[s], given the constrained time period for implementation" and that "Essential Reliability Services may be strained by the proposed [Clean Power Plan]."[54] NERC notes that the primary purpose of the paper was to "provide the foundation for the range of reliability analyses" that will be required for stakeholders to work together. Notably, NERC recommended that coordinated regional and multi-regional planning and analysis should start immediately to identify specific areas of concern and that the EPA should consider a more timely approach to resolving any known reliability concerns.

NERC noted that the accelerated retirement of fossil units will stress already declining reserve margins, and that time will be a major constraint, particularly for facility planning, permitting, and construction. NERC identifies transmission upgrades as potentially being needed to successfully integrate variable energy resources anticipated as part of various states' plans, as well as to support reliability concerns regarding voltage and frequency support associated with extensive re-dispatch of NGCC. NERC also suggested that pipeline capacity constraints will

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other recent federal regulatory initiatives applicable to the electric industry.… In the recent MATS rule, for example, EPA set uniform national standards to reduce emissions from different categories of existing coal- and oil-fired power plants. No trading or averaging is allowed across different generating stations. There is no possibility of purchasing credits resulting from over-compliance at other sources, or to credit emissions reductions resulting from end-use efficiency or zero-carbon energy sources. By contrast with MATS, Section 111(d) inherently allows greater opportunities for different pathways to compliance… And in its [State Plan], each state will have flexibility to propose its own preferred actions to accomplish the targeted reductions, as long as the plan provides reductions across the facilities in the state that are at least as effective as EPA's approach. This language "supports the use of market-based mechanisms" and other alternatives in ways that are not possible under the statutory language governing MATs, which required each affected generating station to have emissions at or below the allowed emissions rates. If a state has concerns about the reliability implications of compliance with EPA guidance, the state can take that fact into account as it designs its SIP and its schedule/timetable for individual units' compliance so long as the overall emission reduction required by the guideline has a firm deadline and is achieved. For example, a state could propose plan elements that enable early action/compliance at some Section 111(d) generating units in exchange for allowing more time for others, or that allow for deeper reductions at one unit in exchange for lighter reductions at another." Source: Susan F. Tierney, "Greenhouse Gas Emission Reductions From Existing Power Plants Under Section 111(d) of the Clean Air Act: Options to Ensure Electric System Reliability," May 2014, pages 3-4.

[53] NERC has stated that its November report, "Potential Reliability Impacts of EPA's Proposed Clean Power Plan: Initial Reliability Review," November 2014 (Hereinafter referred to as "NERC CPP IRR") is the first in a series of reliability assessments that NERC plans to conduct. NERC says it plans to release two additional studies in 2015 that will include a detailed evaluation of generation and transmission adequacy and a preliminary assessment of state SIPs.

[54] NERC CPP IRR, page 2.

exacerbate the strain on essential reliability services from relying more heavily on gas. While a full review of the NERC study is beyond the scope of this paper, we note again that these issues have been emerging in markets for a number of years, well before the introduction of the Clean Power Plan. Indeed, NERC covered these "emerging trends" in California, Hawaii, ERCOT, and other regions in its October primer on "Essential Reliability Services."

Many comments in turn, have cited and expanded on the NERC Review. While reliability has been a common theme of these comments, for the most part the NERC report and the public's comments on the Clean Power Plan do not point to specific, modeled reliability problems that have been identified at known points on the bulk power system. Rather, both the report and the comments focus on generalized concerns about potential reliability issues that may arise due to the operational challenge of meeting both the interim and final-goal targets, generally assuming little in the way of the compliance flexibility built into the proposed rule and available to states. While these are valid concerns, it is critical to recognize the numerous strategies, policies, markets and organizations in place that have successfully dealt with these similar operational challenges in the past, and will going forward, as we discuss further below.

Moreover, the Clean Power Plan proposed rule, like all proposed EPA rules, is a "first draft" that is designed to elicit data and comments. EPA has already signaled that it is evaluating stakeholder concerns about the timing and glide path for meeting interim and final targets, and will evaluate this information as it writes the final rule.

Although we think it is ultimately a good thing that the industry is paying close attention to reliability issues – so that any potential problems can be avoided and addressed in time through planning and infrastructure – we do note recent critiques (e.g., Brattle Group's February 2015 report) of the assumptions used in NERC's recent reliability assessments, which do not take into consideration industry responses to market and reliability signals. This is a significant reason to view the NERC as only having set the table with respect to potential reliability concerns, and to recognize that NERC and many other parties will step up with their important contributions to implementation of the CPP within the electric system reliability context.

IV. Options for Assuring Electric System Reliability in Conjunction with Implementing the Clean Power Plan

The reliability check list

The many comments on the proposed Clean Power Plan submitted to EPA serve as a reminder of the broadly-understood condition that pursuing CO_2 emission reductions in the power sector has to occur in an environment that respects the reliability rules of the game. Like the check list at the start of any endeavor, the comments point out a number of potential items to consider adding to the "to do" list that the electric industry routinely uses to ready itself for reliable system operations.

http://imgkid.com/checklist-icon.shtml

Fortunately, that check list is already robust. There are well-established procedures, regulations and enforceable standards in place to ensure reliable operations, placing the country in a good starting position as of the start of 2015. Many of the reliability issues identified in public comments are not new – the industry has responded successfully and effectively to similar challenges in the past. And for several years, some of the trends that commenters note must now be addressed in response to the Clean Power Plan are actually developments that have been underway for many years – and that are currently being addressed. Examples include the FERC's policies addressing: transmission planning taking into account infrastructure needs arising from state-policy (such as renewable portfolio standards); integration of variable electric resources; market designs to assure efficient entry of capacity with attributes needed for reliable system operations; and directives to modify standards and policies so as to better harmonize operations of the electric and gas markets. Other examples include the many studies conducted by RTOs, electric utilities, national laboratories (like the National Renewable Energy Laboratory and Lawrence Berkeley National Laboratory), research institutions (such as the Electric Power Research Institute, university research centers, and think tanks) , and the Department of Energy.

These many studies are already pointing out that some of the tools and checklists needed for reliability may need to be enhanced as a result of the many changes underway in the industry. In many respects, the shift towards natural gas-fired generation (driven in large part by fundamental economic forces), the proliferation of variable resources due to economic and policy factors, and the growth in distributed resources in some regions will drive changes in industry planning and operations over a schedule largely coincident with implementation of the Clean Power Plan.

In the end, we think that even if sometimes exaggerated, the reliability "alerts" are actually a good thing: It is appropriate that people are paying attention to reliability issues, so that potential problems can be avoided – and they can be addressed in time through proper planning and appropriate responses. Even if some of the existing tools need to be sharpened or even new ones added, past experience, the capabilities of the industry, the attention of regulators, and the inherent flexibility of Clean Power Plan implementation strongly suggest that the task is manageable. As always, careful planning and advance work is necessary to make sure that there are not inefficient trade-offs between the two core objectives.

The Reliability Toolkit: Which ones to use here?

The U.S. electric system performs so reliably because it includes both clearly defined and clearly assigned roles and responsibilities to particular actors, and also relies upon markets and regulated planning processes to provide an array of workable solutions. This is a very sturdy toolkit to build upon. Our suggestions aim to make it even better by pointing out some extra steps that responsible parties might take to make the toolkit as strong as possible for supporting the changes underway in the industry, including Clean Power Plan implementation.

For this reason, we organize our discussion of tools by identifying those in the hands of "reliability organizations" (like grid operators, FERC, NERC, the states, and others) and those in others' hands (including power plant owners, the markets, and many additional players, including the EPA itself). While the latter may not be "reliability organizations" in the same ways that the institutions in the first group are, they still have significant opportunities (if not genuine responsibility) to take actions to help ensure reliable pathways to compliance with CO_2 emission reductions required from the power sector.

In Table 1 at the beginning of our report, we categorize parties into the following groupings:

- Entities with direct responsibility for critical reliability functions;
- Other public agencies with direct or indirect roles in the Clean Power Plan;
- Owners of existing power plants covered by Section 111(d) of the CAA;
- "Markets" and resource planning/procurement organizations; and
- Other entities with inevitable roles to play in ensuring a reliable system in conjunction with enabling effective and timely compliance with the Clean Power Plan.

Note that in some cases, some parties (e.g., a vertically integrated utility which is a balancing authority and also conducts resource/planning and procurements) may fall into one or more categories.

Then we use those groupings not only to identify the normal, business-as-usual responsibilities of those parties, but also to make a number of suggestions for things that those different players might do in anticipation of heading off potential reliability problems before they arise, or in mitigating impacts if they do. Table 2 makes suggestions for what FERC, NERC, the Regional Reliability Organizations, with Table 3 providing suggestions for System Operators/Balancing Authorities might do, in terms of institutionalizing new studies, reporting requirements, and so forth. Table 4 then focuses on things that other federal agencies can do, with Table 5 suggesting actions by state government entities. Table 6 identifies potential actions that might be considered/adopted as part of organized markets to send appropriate and timely signals for investment, and in parallel, what electric utilities might do within their own resource planning/procurement processes to accomplish reliable outcomes in their geographic footprint. Finally, Table 7 provides a number of suggestions about things that other players might do in their own zones of influence.

In the end, the industry, its reliability regulators and the States have a wide variety of existing and modified tools at their disposal to help as they develop, formalize, and implement their respective State Plans. These two responsibilities – assuring electric system reliability while taking the actions required under law to reduce CO_2 emissions from existing power plants – are compatible, and need not be in tension with each other as long as parties act in timely ways.

This is not to suggest that electricity costs to consumers do not also matter in this context; of course they do. But we observe that too often, commenters make assertions about reliability challenges that really end up being about cost impacts. We think that separating reliability considerations from cost consideration is important so as to avoid distracting attention from the actions necessary (and possible) in order to keep the lights on. There may be "lower cost" options that reduce emissions some part of the way toward the target reductions, but that fail to meet acceptable reliability standards. We do not view such 'solutions' as the lowest cost solution, precisely because they fail to account for the cost of unacceptable system outages to electricity consumers. Any plan that starts with consumer costs and works backward to reliability and then to emission reduction is one that fails to consider the wide availability of current tools that have served grid operators for more than a decade to meet reliability needs.

This array of tools is of course subject to important and beneficial social constraints and must be exercised to serve the interests of ratepayers. There is no reason to think that these dual objectives cannot be harmonized within a plan to reduce carbon pollution.

V. Conclusion

In this report we identify the many rules, regulations, institutions, and organizations – in effect, the industry's *standard operating procedures* – for ensuring that EPA's design and administration of the Clean Power Plan in no way jeopardizes or compromises the high level of power system reliability we are used to. Such reliability is essential for the strength of our economy and the public health and safety of our citizens.

In the end, of course, it is a good thing that the industry is paying close attention to reliability issues, so that any potential problems can be avoided – and can be addressed in time through planning and appropriate responses. This is do-able, based on past experience and the capabilities of the industry. As always, careful planning and advance work is necessary to make sure that there are not trade-offs between the two.

Having reviewed the broad range of comments received by EPA with a focus on power system reliability, and the potential reliability challenges posed by Clean Power Plan administration, we find that many of these comments tend to assume inflexible implementation and present worst case scenarios, with an exaggerated cause-and-effect relationship. Moreover, many comments (including those from NERC itself) tend to assume that policy makers, regulators, and market participants will stand on the sidelines until it is too late to act. The history of the electric system and its ability to respond to previous challenges including industry deregulation and previous Clean Air Act regulations such as the NO_x SIP call, SO_2 rule, CSAPR, and MATS prove that this is highly unlikely. These challenges will be solved by the dynamic interplay of regulators and market forces with many solutions proceeding *in parallel*.

Indeed, this dynamic interplay is one reason why a recent survey of more than 400 utility executives nationwide found that more than 60 percent felt optimistic about the Clean Power Plan and felt that EPA should either hold to its current emissions reduction targets or make them more aggressive.[55] Similarly, other market participants announced a willingness and ability to help meet system demand for new natural gas supplies[56] and gas-fired generation, in

[55] The same survey found that those utility executives believed that distributed energy resources offered the biggest growth opportunity over the next five years, and more than 70 percent expect to see a shift away from coal towards natural gas, wind, utility-scale solar and distributed energy. Utility Dive and Siemens, 2015 State of the Electric Utility Survey Results, January 27, 2015. The survey included 433 U.S. electric utility executives from investor-owned, municipal, and electric cooperatives.

[56] See, for example, comments filed by INGAA, December 1, 2014. ("INGAA is confident that … the natural gas pipeline industry can respond to demand for the natural gas pipeline capacity that may be necessary to enable compliance with the Clean Power Plan."). INGAA noted that the existing natural gas pipeline system is already supporting national gas-fired combined-cycle utilization rates of 60 percent during peak periods, which are the same periods when distribution constraints are most likely.

support of the Clean Power Plan.[57] This is in addition to the expanded and innovative solutions and strategies for incremental energy efficiency and distributed energy resources identified by State Regulators and Energy Officials.

There are a number of things states and others can (and, in our view, should) do as part of developing their State Plans to further ensure reliability. First and foremost, states can lean on the comprehensive planning and operational procedures that the industry has relied on to maintain reliability for decades – in the face of both normal operations and sudden changes in markets and policy. These procedures flow from a comprehensive set of laws, rules, protocols, organizations, and industry structures that focus continuously on what is needed to maintain electric reliability.

Second, states should give due consideration to the vast array of tools available to them and the flexibility afforded by the Clean Power Plan in order to ensure compliance is obtained in the most reliable and efficient manner possible. In particular, given the interstate nature of the electric system, we encourage states to enter into agreements with other states or add provisions to state plans that facilitate emission trading between affected power plants in different states; doing so will increase flexibility of the system, mitigate electric system reliability concerns, and lower the overall cost of compliance for all.

[57] See, for example, the comments of Calpine Corporation, filed November 26, 2014. ("With our modern, flexible, and efficient generating fleet, Calpine is prepared to facilitate the successful implementation of the Proposed Clean Power Plan. We are confident that by working constructively with the states and EPA as we have always done, the Clean Power Plan can be a success.")

APPENDIX:
Public Comments on EPA's Proposed Clean Power Plan: Summary of Concerns Relating to Electric System Reliability Issues

As of February 8, 2015, 3.83 million comments have been filed on the EPA's proposed Clean Power Plan.[58] Many organizations have compiled lists and summaries of comments filed by various parties.[59] Most of the comments focus on stringency of the proposed emissions reductions targets, the reasonableness of (and legal bases for) the "building block" methodology used by EPA is setting state targets, the timing of emissions reductions in two periods (interim: 2020-2029); and final (2030 and beyond); the ability of states to develop their State Plans with enough time; and other comments.[60],[61]

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[58] Regulations.gov Docket Folder Summary, Docket No. EPA-HQ-OAR-2013-0602, "Standards of Performance for Greenhouse Gas Emissions from Existing Sources: Electric Utility Generating Units," available at http://www.regulations.gov/#!docketDetail;rpp=100;so=DESC;sb=docId;po=0;D=EPA-HQ-OAR-2013-0602.

[59] See, for example: Bipartisan Policy Center (http://bipartisanpolicy.org/wp-content/uploads/2015/02/Comments_Map_Static.pdf); National Association of State Energy Offices (http://111d.naseo.org/); Advanced Energy Economy (http://blog.aee.net/epa-ghg-regs-we-read-the-comments-so-you-dont-have-to-part-1-state-federal-regulator-association); Institute for 21st Century Energy (U.S. Chamber of Commerce); (http://www.energyxxi.org/eparule-stateanalysis; http://www.energyxxi.org/eparule-stateanalysis).

[60] See, for example, comments filed by APPA, December 1, 2014; Business Roundtable, December 1, 2014; Class of '85 Regulatory Response Group, December 1, 2014; CEG, December 1, 2014; CURC, December 1, 2014; Coalition for Innovative Climate Solutions, December 1, 2014; Edison Electric Institute (EEI), December 1, 2014; Electric Power Supply Institute, December 1, 2014; ERCOT, November 17, 2014; Environmental Defense Fund, December 1, 2014; Georgetown Climate Center (with state officials from California, Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New York, Oregon, Rhode Island, Vermont, and Washington), December 1, 2014; INGAA, December 1, 2014; NARUC, November 19, 2014; NASEO, December 1, 2014; NRDC, December 1, 2014; National Rural Electric Cooperative Association, July 29, 2014; Nuclear Energy Institute (NEI), December 1, 2014; NYISO, November 17, 2014; PJM Interconnection, December 1, 2014; RTO/ISO Council, December 1, 2014; Sierra Club, December 1, 2014; Southern States Energy Council, September 29, 2014; and Western Electricity Coordinating Council (WECC), November 25, 2014.

[61] Even before the final December 1st, 2014 deadline for filing comments, the EPA and other regulators had acknowledged these many public statements and the comments that had been submitted in advance of the deadline. Specifically, in October of 2014, EPA issued a Notice of Data Availability (NODA) that sought comments on three core issues, which we summarize below:

- *Compliance trajectory of emissions reductions from 2020 to 2029*, and in particular, if or how reductions related to building block 2 could be phased in over time (for example, to accommodate constraints in natural gas distribution infrastructure, or how the book life of existing assets could be used to define an alternative glide path) or how states could earn compliance credits for actions taken between 2012 and 2020;
- *Technical assumptions in the building block methodologies for 2 and 3*, including how to consider new gas-fired combined cycle (NGCC) units in state goals, the role of natural gas co-firing at coal plants as a compliance strategy, and if states with little to no existing NGCC capacity should achieve a minimum target of new NGCC generation; and with respect to renewable energy, how or if the EPA could consider alternative goal setting strategies that account for state or regional economic potential of renewables as opposed to relying on existing RPS; and the role of nuclear units in building block 3; and
- *Methodologies for setting State-specific goals*, including the feasibility of using a multi-year baseline (2010-2012) for goal setting, to what extent renewable and energy efficiency goals should be assumed to displace existing fossil generation – as opposed to displacing or avoiding future fossil generation.

The formal NODA is available through Regulations.Gov in Docket No. EPA-HQ-OAR-2013-0602 and informally, through the EPA, here: http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule-notice-data-availability.

Our own review of submissions from the public and various organizations has focused on issues related to system reliability. These commentaries include concerns raised about one or another aspect of the proposal's impact on the power system's performance. Many comments make suggestions for changes in EPA's proposal, and steps that other entities might take to address reliability issues in the context of compliance with the Clean Power Plan.

A common reliability-related comment is that the EPA did not consider – or seek out the expertise – for how the assumptions it used in setting states' emission reduction targets (i.e., the four "building blocks") may change the operations of the electric grid and how those changes in turn can affect the ability to meet state targets.[62] A similar theme is that the individual state targets do not account for the regional nature of electric grid reliability. Finally, a common concern is that the proposed timeframes for compliance, combined with the interim targets for emissions reductions commencing in 2020, do not provide adequate time for states to develop regional compliance plans or for RTOs to incorporate State Plan provisions into the regional long-term planning frameworks or existing market rules for economic dispatch.

That said, a wide range of regulators and other organizations have committed to working with the EPA and the states to manage these challenges, and in turn, leverage their detailed knowledge of the electric system. As discussed later in this report, many regional coordinators and state regulators already have planning policies and procedures in place that can proceed in parallel with the development of SIPs to ensure the timely development of generation, transmission, and distribution infrastructure needs.[63]

Although the comments do not point to specific known, localized reliability problems identified by a specific commenter, many observers caution that if a state elects not to (or cannot, for one reason or another) accomplish the depth of emission reductions assumed by EPA in state

[62] For example, the EEI noted that "a significant portion of [it's] comments is devoted to explaining how the system operates and how electric utilities, states and system operators engage in complex planning to maintain the reliability of the interconnected power system." Comments filed December 1, 2014, at 12. Similarly, on December 22, 2014, Senator Murkowski (ranking member, Committee on Energy & Natural Resources), Representative Upton (Chairman, Committee on Energy & Commerce), and Representative Whitfield (Chairman, Subcommittee on Energy & Power) requested comment from the FERC Commissioners on their level of involvement and interaction with EPA staff when developing the Clean Power Plan and understanding reliability implications. Letter to FERC from Senator Murkowski, Representative Upton, and Representative Whitfield, December 22, 2014.

[63] Note for example, recent activities among the PJM states: the recent comments submitted to the FERC (Docket No. AD15-4-000: Technical Conference on Environmental Regulations and Electric Reliability, Wholesale Electricity Markets, and Energy Infrastructure, February 19, 2015) by Michael Kormos, Executive Vice President for Operations, PJM: "PJM has begun this coordination process by engaging state commissions, state environmental regulators responsible for implementing the Clean Power Plan, and EPA starting last year. Recently, PJM has undertaken detailed analyses of scenarios and alternatives that were provided to us by OPSI. Those results have been reviewed with our members and with the states and are posted on our website at http://www.pjm.com/~/media/committeesgroups/committees/mc/20150120-webinar/20150120-item-05-carbon-rule-analysis.ashx.

targets, then the state will inevitably need to make additional cuts from other blocks which will increase the stress on remaining assets and strategies.

Comments on reliability issues thus tend to focus on challenges in system operation that may lead to reliability failures. The commentaries do, however, provide suggestions for how to mitigate the challenges for system reliability failures by building into State Plans alternative strategies for meeting those same targets beyond those incorporated into EPA's target-setting assumptions. For example, comments by both NARUC and NASEO discuss the extensive potential for additional CO_2 savings from energy efficiency projects at the interface of the energy-water nexus and other energy-efficiency initiatives outside of conventional programs administered by electric utilities. Additional guidance or clarification from the EPA on how to account for these programs in State Plans could unleash and incentivize a broad swath of carbon reduction strategies beyond the narrow four building blocks.

Many comments focused on the implications of greater utilization of natural gas-fired power plants on changes in system dispatch and the interdependence of interim and final state goals.[64] Achieving a system-wide 70-percent capacity factor for existing natural-gas combined cycle (NGCC) units, for example, would transition a set of power plants now used largely as intermediate and load-following resources to become base-load capacity resources. Baseload coal-fired generators in place at the end of the 2010s would feel the effects, through either greater cycling of these units, or retention of the units to operate only occasionally if needed to remain on the system for resource adequacy purposes, or retirements. Observers note that cycling such coal-fired units more frequently will decrease their efficiency (i.e., increase their heat rates), as plants use additional energy to overcome the inertia inherent in these units. Commenters' cautions that such impacts will increase the overall fleet average emission profile. The observation is that such interactions will mean that states will need to find additional carbon reductions elsewhere. To the extent that the shift includes greater reliance on renewable energy penetration, then the system operators will need to adjust how they operate the resources on their system to maintain reliability. These variable energy resources do not offer system operators the same level of control (e.g., some may be behind the meter and therefore not even "visible" to operator) for frequency or voltage support nor can they be relied upon to meet load in all hours of the day. In the absence of significant new storage capability on the system, this will increase the need for load-following, fast-ramping resources to respond to

[64] The U.S. Chamber of Commerce Institute for 21st Century Energy reviewed and summarized State comments and found that 35 states raised issue with Building Block 2. This was more than any other category identified by the report. Institute for 21st Century Energy, U.S. Chamber of Commerce. "In Their Own Words: A Guide to States' Concerns Regarding the Environmental Protection Agency's Proposed Greenhouse Gas Regulations for Existing Power Plants", January 22, 2015, page 14.

sudden drops in renewable generation. Traditionally, gas-fired combined cycles or natural gas combustion turbines have met this need. But gas-fired plants that begin to operate more in baseload mode may not be able to perform that load-following function. As described in Section II, Figure 2 above, lead times for implementing peaking generating units and demand-side actions (e.g., programs leading to installation of energy efficiency measures; equipping buildings with automated capability to control demand when signaled to do so by the system operator; adding solar PV panels) are much shorter than those for large power plants and transmission upgrades.

These changes are already underway in part due to the shale gas revolution, state and federal policies supporting renewable energy, other environmental policies. According to some observers, the Clean Power Plan will accelerate such trends. Either way, grid operators will need to address the potential diminishing reservoir of voltage support and inertia that has historically been supplied by coal-fired thermal units with their rotating mass of equipment.

Also, the successful operation of natural gas combustion turbines to balance and integrate intermittent and variable renewable supplies will depend, in turn, on the availability and access to fuel when needed for dispatch. Commenters have suggested, and rightly so, that a significant increase in gas-fired generation will require new gas delivery infrastructure. (We note the recent report published by the U.S. DOE that found, among other things, that the amount of incremental gas infrastructure needed is less than what has been put in place by the industry in the recent past.[65]

> Diverse sources of natural gas supply and demand will reduce the need for additional interstate natural gas pipeline infrastructure. The combination of a geographic shift in regional natural gas production—largely due to the expanded production of natural gas from shale formations—and growth in natural gas demand is projected to require expanded natural gas pipeline capacity. However, the rate of pipeline capacity expansion in the scenarios considered by this analysis is lower than the historical rate of natural gas pipeline capacity expansion. …
>
> (2) Higher utilization of existing interstate natural gas pipeline infrastructure will reduce the need for new pipelines. The U.S. pipeline system is not fully utilized because flow patterns have evolved with changes in supply and demand. …
>
> (3) Incremental interstate natural gas pipeline infrastructure needs in a future with an illustrative national carbon policy are projected to be modest relative to the Reference Case. While a future carbon policy may significantly increase natural gas demand from

[65] U.S. DOE, "Natural Gas Infrastructure Implications of Increased Demand from the Electric Power Sector, February 2015, http://energy.gov/sites/prod/files/2015/02/f19/DOE%20Report%20Natural%20Gas%20Infrastructure%20V_02-02.pdf. After modeling interactions between the gas and electric industries, the report's key findings (at iv-v).

> the electric power sector, the projected incremental increase in natural gas pipeline capacity additions is modest relative to the Reference Case.
> (4) While there are constraints to siting new interstate natural gas pipeline infrastructure, the projected pipeline capacity additions in this study are lower than past additions that have accommodated such constraints."

It will take time – in some cases several years – to build this infrastructure, and unlike transmission planning that is coordinated by a central planning authority, expansion of the gas delivery and storage system is driven by market economics. But significant amount of pipeline expansion is already in advanced planning and permitting. Thus, while typically, gas pipeline companies require long-term commitments from 'anchor' gas shippers before receiving permitting approval and proceeding to break ground, there is no reason to believe that the system will be short of capacity as a result of the Clean Power Plan. Indeed, such commitments have and can be made in many regions (notably, in Colorado, as part of the state's approval of Xcel's decision to replace parts of its coal fleet with gas-fired plants, or in the Midwest, where DTE Energy has committed to support pipeline expansion to access gas supplies in the Marcellus). In some organized wholesale electric markets, however, there may need to be changes in some market rules and/or new institutional commitments to induce new investment in firm pipeline expansion to make gas available to non-utility generators.

Another issue raised in many comments relates to the current uncertainty that exists with regard to how states may/should/will count *new* gas-fired combined cycle power plants in their overall planning. Because such new plants fall under a different part of the Clean Air Act (i.e., Section 111(b)) than existing power plants (i.e., Section 111(d)), EPA has suggested that states will have the option to determine whether to fold in new plants into their overall framework for controlling emissions of then-existing power plants, or to keep those new plants regulated under a separate regime. What states will do remains a critical unknown, and could affect the operations of the overall power system, as well as emissions from the plants now covered under the Clean Power Plan.[66]

Beyond regional concerns and detailed technical criticisms, the most frequent reliability-related comments focus on the implications of the interim targets and the timelines for compliance.[67]

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[66] For example, states with an emission rate goal less than 1,000 lbs/MWh may meet such a target through extensive renewable resources. The use and reliance on new NGCC units (with an emission rate equal to 1,000 lbs/MWh) to provide significant quantities of energy when renewables are off-line may actually increase net total emissions.

[67] The current rule includes two compliance options: a 2030 final goal with an interim compliance goal for average emissions between 2020 and 2029, and a second option, with lower total goals and no interim goals, to be achieved by 2025. Under option 1, States are required to file their SIP by June 30, 2016, with one year extensions available for single states and two years for multi-state plans. EPA has committed to reviewing and approving all SIPs within one year of receipt. Therefore, final SIPs will take effect

Commenters point out that the compliance timeline presents at least two challenges. The first is the added pressure on resource adequacy in light of pending retirements, particularly of economically marginal coal units facing difficult retrofit decisions for compliance with ongoing air regulations such as the MATS.[68] The second is the asserted lack of time for states to develop regional plans for compliance, which could easily require multi-year time frames to coordinate necessary staff in legislative departments, PUCs, and state energy and air offices.

Others have raised the issue that the timelines will result in significant stranded costs for ratepayers.[69] While not a reliability issue per-se, these stranded costs carry a true economic cost in that those monies may have been better spent on other programs in support of the Clean Power Plan project. However, as we discussed we observe that too often, commenters make assertions about reliability challenges that really end up being about cost impacts. We think that separating reliability considerations from cost consideration is important so as to avoid distracting attention from the actions necessary (and possible) in order to keep the lights on. There may be "lower cost" options that reduce emissions some part of the way toward the target reductions, but that fail to meet acceptable reliability standards. We do not view such 'solutions' as the lowest cost solution precisely because they fail to account for the cost of unacceptable system outages to electricity consumers. Any plan that starts with consumer costs and works backward to reliability and then to emission reduction is one that fails to consider the wide availability of current tools that have served grid operators for more than a decade to meet reliability needs.

between June 30, 2017 and June 30, 2019. Interim compliance goals for each state are set for the 2020 to 2029 period, in what is commonly referred to as the "glide path" of emission reductions to the 2030 target. The interim compliance goals assume that states can achieve the full quantity of reductions equal to estimates from Building Block 1 and Building Block 2. The "glide" in the interim targets, then, is due to the steady increase in carbon reductions from avoided fossil fuel generation in the 2020-2029 period from increasing levels of renewable energy and energy efficiency deployment.

[68] For example, MISO estimated that between 10 -12 gigawatts of coal-fired capacity will retire by 2016 to meet the MATS rule. An additional 14 gigawatts of coal-fired generation (25 percent of the remaining supply) is further at risk of retirement by 2020. MISO conservatively estimates that it will take a minimum of six years for the necessary generation and transmission infrastructure to replace these retirements. Assuming that all state plans are finalized and approved by 2018, necessary infrastructure would not be in place until 2024 – leaving a four year gap of increased reliability risk. MISO, "Analysis of EPA's Proposal to Reduce CO_2 Emissions from Existing Electric Generating Units," November 2014.

[69] For example, Ameren estimated that the 2020-2029 interim timelines could cost Missouri ratepayers an additional $4 billion compared to its existing Integrated Resource Plan (IRP). Ameren noted that its existing IRP assumes the full retirement of coal units at the end of their useful lives by 2034. The early retirements would move forward the in-service date for proposed NGCC and require additional capacity than would otherwise be needed by 2034. See Comments of Ameren, filed December 1, 2014, at 3.

Acronyms

Acronym	Definition
APPA	American Public Power Association
BPS	Bulk Power System
BTM	Behind the Meter
CAA	Clean Air Act
CAISO	California Independent System Operator
CPP	Clean Power Plan
CO_2	Carbon Dioxide
CSAPR	Cross State Air Pollution Rule
CURC	Coal Utilization Research Council
CWA	Clean Water Act
EEI	Edison Electric Institute
EGU	Electric Generating Unit
EPA	Environmental Protection Agency
ERCOT	Electric Reliability Council of Texas
ERO	Electric Reliability Organization
ERSs	Essential Reliability Services
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
IRP	Integrated Resource Plan
ISO	Independent System Operator
ISO-NE	Independent System Operator – New England
MATS	Mercury and Air Toxics Standard
MISO	Midcontinent Independent System Operator
NAAQS	National Ambient Air Quality Standards
NASEO	National Association of State Energy Officials
NARUC	National Association of Utility Regulatory Commissioners
NEI	Nuclear Energy Institute
NERC	North American Electric Reliability Corporation
NGCC	Natural Gas Combined Cycle
NODA	Notice of Data Availability
NYISO	New York Independent System Operator
OATT	Open Access Transmission Tariff
PJM	PJM Interconnection
PUC	Public Utility Commission
RPS	Renewable Portfolio Standard
RSV	Reliability Safety Valve
RRO	Regional Reliability Organization
RTO	Regional Transmission Organization
SIPs	State Implementation Plans
SPP	Southwest Power Pool
VER	Variable Energy Resources (e.g., wind and solar)
WECC	Western Electric Coordination Council

ORAL ARGUMENT NOT YET SCHEDULED

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

STATE OF NORTH DAKOTA, et al., Petitioners, v. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, Respondent.	)	Case No. 24-1119 (and consolidated cases)

DECLARATION OF SEAN WENRICH, P.E.

I, Sean Wenrich, P.E., pursuant to 28 U.S.C § 1746, state and declare as follows:

1. I am an Environmental Engineer Manager for the Division of Permits in the Bureau of Air Quality ("BAQ"), Commonwealth of Pennsylvania, Department of Environmental Protection's ("PADEP"), Central Office, Rachel Carson State Office Building, 400 Market Street, Harrisburg, Pennsylvania 17101. PADEP is the Commonwealth executive branch agency responsible for regulating air pollution

in Pennsylvania under the Air Pollution Control Act ("APCA") (35 P.S. §§ 4001-4015) and implementing the provisions of the federal Clean Air Act ("CAA"), 42 U.S.C. §§ 7401- 7671q.

2. I submit this declaration on behalf of the Commonwealth of Pennsylvania in support of the intervenor-respondent state and local governments' opposition to the motions to stay the Environmental Protection Agency's ("EPA") final rulemaking action entitled *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review*, 89 Fed. Reg. 38, 508 (May

7, 2024) ("MATS RTR"), which strengthens the Mercury and Air Toxics Standards ("MATS"), 77 Fed. Reg. 9304 (Feb. 16, 2012).

3. Unless otherwise noted, the statements made in this declaration are based on my review of various publicly available records, reports, statements, and data compilations prepared by public agencies of the federal government and/or the Commonwealth.

PERSONAL QUALIFICATIONS

4. I received a Bachelor of Science in Chemical Engineering from Widener University in Chester, Pennsylvania in December 2001. I am a licensed professional engineer in Pennsylvania.

5. I have served as an Environmental Engineer Manager for PADEP since September 2016. I have been employed by PADEP in the Air Quality Program in both the Northcentral Regional Office in Williamsport, Pennsylvania and the Central Office in Harrisburg, Pennsylvania for a total of over 21 years.

6. I previously served at PADEP as an Air Quality Engineering Specialist from 2004 to 2012 and as an Air Quality Engineer from 2012 to 2016. These roles involved implementation of permitting program requirements under the APCA, the CAA and implementing state and federal regulations. These responsibilities involved the review of air quality permit applications and determinations of pollution control technologies for sources and facilities in Pennsylvania, including coal-fired electric generating units ("EGU").

7. In my current role as an Environmental Engineer Manager with PADEP, I supervise employees in the Bureau of Air Quality, Division of Permits, New Source Review Section located in PADEP's Central Office.

8. My current duties at PADEP involve administration of the APCA and implementing Title 25, Part I, Article III regulations (relating to air resources) and the federal CAA and implementing EPA regulations.

9. As an Environmental Engineer Manager, I am responsible for assisting in the management of the daily administration and implementation of PADEP's plan approval and operating permit programs under 25 Pa. Code Chapter 127, which includes implementation of the Title V permitting program applicable to EGUs.

10. My duties further entail administration and implementation of EPA's National Emission Standards for Hazardous Air Pollutants ("NESHAP") for Source Categories promulgated in 40 CFR part 63.

A NUMBER OF COAL-FIRED POWER PLANTS IN PENNSYLVANIA WILL REQUIRE PARTICULATE MATTER CONTROL UPGRADES TO COMPLY WITH THE MATS RTR.

11. The MATS RTR strengthens the limits on emissions of mercury and non-mercury metals hazardous air pollutants ("HAPs") from coal-fired power plants. With regard to non-mercury metals HAPs, the MATS RTR requires coal-fired plants to meet a new, lower filterable particulate matter ("fPM") limit of 0.010 lbs/MMBtu. That fPM standard is used as a surrogate measure for non-mercury metal HAPs, as those pollutants are part of the particulate matter ("PM") emitted when coal is burned.

12. EPA anticipates that, nationwide, 27 coal-fired plants will be required to make expenditures to either upgrade their existing PM controls or to optimize operation of those controls

in order to meet the new fPM standard for non-mercury metal HAPs under the MATS RTR.[1] Five of those plants are located within the Commonwealth, as shown in Table 1.

13. All five of those units are "waste coal" plants, which means that they burn material that is a byproduct of previous coal mining operations, usually consisting of a mixture of coal, soil, and rock.

14. The nine other coal-fired plants in the Commonwealth that that are also subject to MATS already meet the MATS RTR's 0.010 lb/MMBtu fPM standard using the same technologies that the five plants would need to install or optimize under the MATS RTR.

15. Together, those five plants that will require upgrades have a total rated capacity of 349 megawatts ("MW"), or approximately 4% of the Commonwealth's overall coal-fired rated capacity of 8,472 MW, which includes a total of ten waste coal plants, as well as the Keystone, Conemaugh, Montour, and Brunner Island coal-fired plants.

THE MATS RTR WILL REDUCE HARMFUL PARTICULATE MATTER POLLUTION IN THE COMMONWEALTH.

16. The non-mercury metal HAPs regulated by the MATS RTR include, arsenic, cadmium, chromium, lead, nickel, and selenium, which are associated, individually and in mixtures, a wide range of serious health harms, including adverse neurological, cardiovascular, immunological, reproductive, liver, kidney, and respiratory effects, as well as cancer.[2]

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[1] EPA, *2024 Update to the 2023 Proposed Technology Review for the Coal- and Oil-Fired EGU Source Category (2024 Technical Memo* (Jan. 2024), Attachment 1: Excel spreadsheet with unit list of EGUs, cost and emission reduction assumptions, and calculations for the assessed limits at Tab 4 (0.010 limit assumptions), Docket ID. No. EPA-HQ-OAR-2018-0794-6919.

[2] *See* Comments of the Attorneys General of Massachusetts, et al. at 5 (June 23, 2023), Docket ID No, EPA-HQ-OAR-2018-0794-5988.

17. Serious health harms are also associated with the fPM, in particular the fine PM or $PM_{2.5}$ (fine particles that are less than 2.5 micrometers in diameter) components. $PM_{2.5}$ can accumulate in the respiratory system and is associated with numerous adverse health effects. Certain sensitive groups, including the elderly, individuals with cardiopulmonary disease such as asthma, and children, appear to be at greatest risk from inhalation of $PM_{2.5}$.

18. EPA anticipates that compliance with the new limit under the MATS RTR by these plants collectively will reduce emissions of total non-mercury metal HAPs by 0.297 tons and filterable $PM_{2.5}$ by 46.7 tons each year in the Commonwealth, or by 40.2 percent and 37.7 percent, respectively, from baseline levels for those plants. For comparison, in 2022, reported emissions of these pollutants from stationary sources in the three counties in which the plants are located (Schuylkill, Northumberland, and Cambria) were 1.584 tons of total non-mercury metal HAPs and 204.32 tons of $PM_{2.5}$.[3]

19. Almost all of those reductions will come from four of the plants which are located within an approximately 130 square mile area in Schuylkill and Northumberland counties.

20. Further, three of the five plants (Colver, Rausch Creek (formerly Westwood), and Foster Wheeler Mt. Carmel Cogen) are located within environmental justice areas based on the Commonwealth's Environmental Justice screening tool, PennEnviroScreen, https://gis.dep.pa.gov/PennEnviroScreen/. An "environmental justice area" is defined as "[a] geographic area characterized by increased pollution burden, and sensitive or vulnerable

[3] Because this measure of PM2.5 includes *both* filterable and condensable PM, it provides a conservative comparison, as the condensable PM provides additional mass to the total. Condensable PM is material that is captured through a condensation process, rather than through a mechanical filtering process.

populations based on demographic and environmental data," pursuant to Pennsylvania's Environmental Justice Policy.[4]

21. In addition, Cambria County, where the Colver power plant is located, and Dauphin, Lancaster, and York Counties, which are adjacent or near to Schuylkill and Northumberland Counties, where the four other plants are located have 2022 and 2023 annual $PM_{2.5}$ design values that are in excess of the primary annual 2024 $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS), which are designed to protect public health from the $PM_{2.5}$ by limiting that amount of that pollutant present in the ambient air.[5]

22. Thus, not only will residents of the Commonwealth—including those located in environmental justice communities—receive health benefits from reduced emissions of non-mercury metal HAPs and the associated $PM_{2.5}$ that the MATS RTR will require, those reductions will assist the Commonwealth in meeting its regulatory obligations under federal law to come into compliance with the NAAQS.

23. Finally, the additional requirement under the MATS RTR that all subject coal- and oil-fired units begin using PM continuous emissions monitoring systems (CEMS) technology will assist the Commonwealth in demonstrating attainment with NAAQS and protecting the surrounding communities from the harms of those emissions. That technology will allow for

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[4] PADEP, *Environmental Justice Policy* at 3 (Sept. 16, 2023), https://greenport.pa.gov/elibrary//GetDocument?docId=5600403&DocName=ENVIRONMENTAL%20JUSTICE%20POLICY.PDF%20%20%3cspan%20style%3D%22color:green%3b%22%3eCOMMENTS%20DUE%20OCTOBER%2029%2c%202023%3c/span%3e%20%3cspan%20style%3D%22color:blue%3b%22%3e%28NEW%29%3c/span%3e.

[5] PADEP Air Quality Technical Advisory Committee, *Fine Particulate Matter (PM2.5), National Ambient Air Quality Standard* 14-15 (Apr. 4, 2024), https://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/Advisory%20Committees/Air%20Quality%20Technical%20Advisory%20Committee/2024/4-4-24/PM2.5_AQTAC_PRESENTATION_4-4-24.pdf.

continuous monitoring of emissions, which will identify any problems with emission control systems in real time, rather than relying on stack-testing, and ensure that such problems are addressed immediately, preventing unnecessary and previously undetected emissions.

Table 1. Coal-Fired Power Plants in Pennsylvania Requiring Upgrades Pursuant to the MATS RTR*

Name	Location	Capacity (MW)	Upgrade Required	Annual Non-Mercury Metals HAPs Reduction Anticipated (tons)	Annual $fPM_{2.5}$ Reduction Anticipated (tons)
John B. Rich Mem. Power Station (2 units)	Frackville, PA Schuylkill County	80	Increased Std. Bag frequency	0.1104	17.2
Foster Wheeler Mt. Carmel Cogen	Marion Heights, PA Northumberland County	43	Increased Std. Bag frequency	0.1102	8.6
Rausch Creek Generation[6]	Tremont, PA Schuylkill County	30	Bag Type Upgrade	0.0554	8.6
St. Nicholas Cogen Project	Shenandoah, PA Schuylkill County	86	Increased Std. Bag frequency	0.0736	11.5
Colver Power Project	Colver, PA Cambria County	110	Increased STd Bag frequency	0.0023	0.5

*Source: EPA, *2024 Update to the 2023 Proposed Technology Review for the Coal- and Oil-Fired EGU Source Category (2024 Technical Memo* (Jan. 2024), Attachment 1: Excel spreadsheet with unit list of EGUs, cost and emission reduction assumptions, and calculations for the assessed limits at Tab 4 (0.010 limit assumptions), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-6919

[6] This facility is identified as "Westwood Generation LLC" in the EPA Technical Memorandum but is now known as "Rausch Creek Generation."

I declare under penalty of perjury under the laws of the United States of America that I believe the foregoing to be true and correct to the best of my knowledge and belief.

FOR THE COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION:

SEAN WENRICH

Sean Wenrich, P.E.
Environmental Engineer Manager Division of Permits Bureau of Air Quality

Executed in Harrisburg, PA on July, 17 2024.

Commonwealth of Pennsylvania

County of Dauphin

Signed (or attested) before me on July 17, 2024 (date)

By Sean Wenrich (name(s) of individual(s)).

Commonwealth of Pennsylvania - Notary Seal
AUTUMN BOYCE - Notary Public
Schuylkill County
My Commission Expires May 25, 2026
Commission Number 1360587

Autumn Boyce
Notary Public

I, Serena K. Wetherelt, hereby declare as follows:

1. I am over 18 years of age and reside in Lame Deer, Montana. I am President of the Northern Cheyenne Tribe.

2. The Northern Cheyenne Tribe has been a federally recognized Indian tribe since the Friendship Treaty of 1825. The Tribe now occupies the Northern Cheyenne Reservation, which is composed of approximately 444,000 acres of land in Big Horn County and Rosebud County, Montana. The Tribe has approximately 11,000 members, many of whom live on or near the Reservation.

3. The Northern Cheyenne Reservation is approximately 20 miles south of the Colstrip power plant. About 100 Northern Cheyenne Tribal members are employed by the Colstrip plant or the adjacent Rosebud mine that supplies coal to Colstrip. Many Tribal members also live in the town of Colstrip.

4. As explained below and in the Tribe's prior comments to EPA (attached as *Exhibit A)*, the Northern Cheyenne Tribe supports the U.S. Environmental Protection Agency's rule strengthening limits on toxic air pollution from coal plants such as Colstrip, the "Mercury and Air Toxics Standards Strengthening Rule." Colstrip's timely compliance with the new limits will improve air quality and benefit the health of tribal members. Additionally, although the Tribe does not advocate for the closure of the Colstrip plant, in the

event of closure, the Tribe's development of clean-energy resources offers viable alternative energy sources that benefit the local economy.

Colstrip's Compliance with the Mercury and Air Toxics Standards Strengthening Rule Will Improve Local Air Quality and Public Health of Northern Cheyenne Tribal Members

5. The Northern Cheyenne Tribe has taken steps to protect air quality and the health of tribal members living on and near the Reservation. Concerned about the proposed construction of Colstrip Units 3 and 4, in 1976 the Tribe proposed to redesignate the Reservation as a Class I airshed under the Clean Air Act. After EPA approved the Tribe's proposal in 1977, granting special protection for air quality and visibility protection on the Reservation, the Tribe exercised its authority to require additional air pollution controls on the new Colstrip units. And in 2007, the Tribe and EPA entered a consent decree with Colstrip's owners that required the installation of equipment to reduce the plant's harmful nitrogen oxide emissions.

6. While these efforts have protected air quality on the Northern Cheyenne Reservation to a significant degree, Lame Deer is designated federally as a nonattainment area for large particulate matter (PM10) pollution. This means that particulates in the air exceed federal limits established to protect public health.

7. Hazardous air pollutants and the particulate matter emitted with these pollutants are known to cause and exacerbate health problems, including lung

cancer and other respiratory illnesses such as asthma, particularly among children and elderly individuals.

8. Incidence of cancer, lung cancer, and asthma in Rosebud County, and on the Northern Cheyenne Reservation in particular, are elevated compared to the rest of Montana.

9. I understand that Colstrip's emissions of non-mercury metal air pollution—which includes lead, nickel, and chromium and is measured as filterable particulate matter—are currently two to three times the new limit that EPA adopted based on industry-wide improvements in pollution control. These non-mercury metals are inherently hazardous and are classified as known or probable human carcinogens. Colstrip Units 3 and 4 are the highest and third-highest emitters of such pollution in the country.

10. Because most Northern Cheyenne Tribal members live on and near the Reservation—including in the town of Colstrip—and many Tribal members are employed at the Colstrip power plant and nearby Rosebud mine, they are disproportionately exposed to Colstrip's hazardous air pollution.

11. Colstrip's compliance with the new limits would reduce hazardous air pollution and therefore improve the health of Tribal members living on and near the Reservation.

Investment in Tribally Developed Wind, Solar, and Storage Resources Would Limit Local Economic and Resource Adequacy Impacts Due to Colstrip's Eventual Closure

12. I understand that in their challenges to the Mercury and Air Toxics Strengthening Rule, the State of Montana, Talen Energy, and NorthWestern Energy claim that the Colstrip plant may retire rather than invest in new pollution controls necessary to meet the new hazardous air pollution limits. The Tribe does not advocate for closure of the plant, but the Tribe recognizes that the plant will close eventually, whether due to the EPA's new air pollution rules, the age of the plant, or market conditions.

13. NorthWestern Energy has an opportunity (and has had opportunities) to plan for such closure by investing in Tribal energy resources. The Northern Cheyenne Tribe is helping to lead the transition to a clean energy economy through renewable energy development consistent with our cultural beliefs. Investment in wind, solar, and storage projects offer a means to help provide jobs for tribal members and members of the surrounding community, to work toward tribal energy independence and statewide resource adequacy, and to help contribute to a cleaner environment.

14. The Northern Cheyenne Tribe has consistently advocated for planning by Colstrip's owners and the Montana Public Service Commission for Colstrip's eventual closure, including plans for an economic transition of local communities

(including the Northern Cheyenne Tribe) and for the development of clean energy resources to replace Colstrip power.

15. In February 2019, the Tribe submitted testimony in NorthWestern Energy's general rate case before the Montana Public Service Commission urging NorthWestern Energy to assist the Tribe in planning for a transition to renewable energy resources to replace coal and for the economic transition of the tribal economy. *See Exhibit B.*

16. In 2023, the Tribe submitted comments on NorthWestern Energy's Integrated Resource Plan, noting that the Tribe is developing significant wind and solar energy resources that could help NorthWestern Energy meet customer demand. *See Exhibit C.* Because those projects will be developed under the Tribe's leasing and review framework (rather than state or federal frameworks) and are in close proximity to the Colstrip Transmission System, they could become operational within a short (less than two years) period of time. Additionally, the Tribe's comments observed the significant economic incentives under the Inflation Reduction Act for siting such energy projects on the Northern Cheyenne Reservation, greatly improving their affordability for NorthWestern and its customers. The comments state:

> The Northern Cheyenne Tribe has determined that responsible development of the Northem Cheyenne Tribe's renewable energy resources can provide for economic development of such resources in a manner that maximizes

> the benefits to the Tribe and is consistent with the Tribe's traditional, cultural, and environmental values. And while clean energy development on the Reservation benefits the Tribe and its members, investment by NorthWestern Energy in such development would additionally provide economic opportunities to the communities near the Reservation, as well as extraordinary benefit to the utility's Montana electric customers. At the same time, NorthWestern's plan to expand its reliance on Colstrip power would harm the Tribe without providing corresponding economic and environmental benefits.

Exhibit B at 1.

17. Investment by NorthWestern Energy and other Colstrip owners in the Northern Cheyenne Tribe's clean-energy projects would help offset any statewide energy shortfall due to Colstrip's closure, while providing significant economic benefits to the Tribe and tribal members.

18. Any delay in Colstrip's compliance with the Mercury and Air Toxics Standards Strengthening Rule would unreasonably defer important air quality and health benefits for Northern Cheyenne Tribal members who are disproportionately impacted by Colstrip's toxic air pollution. And it would only prolong NorthWestern Energy's and Talen's failure to plan for the future beyond Colstrip.

19. I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 15, 2024 in Lame Deer, Montana.

Serena K. Wetherelt

Serena K. Wetherelt

Exhibit A

Declaration of President Serena K. Wetherelt

-WOHEHIV-
The Morning Star

NORTHERN CHEYENNE TRIBE
ADMINISTRATION

P.O. BOX 128
LAME DEER, MONTANA 59043
(406) 477-6284
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-WOHEHIV-
The Morning Star

June 23, 2023

Sarah Benish
Sector Policies and Programs Division
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Re: Proposal on National Emissions Standards for Hazardous Air Pollutants: Coal and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, **Docket ID No. EPA–HQ–OAR–2018–0794**

Dear Ms. Benish:

I write on behalf of the Northern Cheyenne Tribe, a federally recognized Tribe based on the Northern Cheyenne Reservation in southeastern Montana, to urge EPA to finalize protective Mercury and Air Toxics Standards (MATS) and to reject claims by the owners of the Colstrip coal plant that would continue to subject tribal members to unhealthy air.

The Northern Cheyenne Reservation is twenty miles from Colstrip, Montana and the Colstrip coal-fired power plant. Since the Colstrip plant was first proposed, the Tribe has taken steps to protect its people from the harmful effects of air pollution from the plant, which disproportionately impacts tribal members. For example, concerned about the proposed construction of Colstrip Units 3 and 4, in 1976 the Tribe proposed to redesignate the Reservation as a Class I airshed under the Clean Air Act. After EPA approved the Tribe's proposal in 1977, the Tribe exercised its authority to require additional air pollution controls on the new Colstrip units.

The Tribe supports EPA's efforts to establish appropriate limits on Colstrip's emissions of hazardous air pollutants. EPA explains, exposure to these pollutants harms human health, including "potential neurodevelopmental impairment, increased cancer risks, and contribution to chronic and acute health disorders, as well as adverse impacts on the environment." Final Rule, Revocation of the 2020 Reconsideration and Affirmation of the Appropriate and Necessary Supplemental Finding, 88 Fed. Reg. 13,956, 13,968 (Mar. 6, 2023). Because of the proximity of the Northern Cheyenne tribal members to the Colstrip plant—living both on the Reservation and in the nearby community of Colstrip, where many tribal members are employed—they are disproportionately impacted by exposure to hazardous air pollutants.

Although cost-effective pollution controls are available to reduce toxic air emissions from Colstrip Units 3 and 4, namely baghouses and electrostatic precipitators, Colstrip's owners have refused to install them. As a result, Colstrip has the highest rate of filterable particulate matter emissions (a surrogate for non-mercury hazardous air pollutants) in the country and is the only plant still operating without industry-standard particulate matter controls. Colstrip has a history of exceeding even the current standard for non-mercury hazardous air pollutants.

Two of Colstrip's owners—NorthWestern Energy and Talen Montana—and Rosebud mine owner Westmoreland oppose EPA's proposal to strengthen the MATS to align with Clean Air Act requirements. According to the companies, compliance with lower limits for non-mercury hazardous air pollutants would be too costly. Such arguments irresponsibly ignore the acute health effects—including premature deaths—that Colstrip's toxic emissions have on Northern Cheyenne tribal members and the many others who live in close proximity to the plant.

The Tribe urges EPA to finalize protective MATS. Under the new standards, Colstrip Units 3 and 4 should be required to install the same controls that other plants around the country have already installed and to operate those controls to achieve maximum emissions reductions, as the Clean Air Act requires. 42 U.S.C. § 7412(d)(2), (f).

Respectfully,

William Walks Along, Tribal Administrator
Northern Cheyenne Tribe

Exhibit B

Declaration of President Serena K. Wetherelt

DEPARTMENT OF PUBLIC SERVICE REGULATION
BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MONTANA

IN THE MATTER OF THE Application by NorthWestern Energy for the Authority to Increase Retail Electric Utility Service Rates and for Approval of Electric Service Schedules and Rules and Allocated Cost of Service and Rate Design	REGULATORY DIVISION Docket No. D2018.2.12

THE NORTHERN CHEYENNE TRIBE

INTERVENOR TESTIMONY FROM MR. WILLIAM WALKSALONG,

TRIBAL ADMINISTRATOR

February 12, 2019

The Northern Cheyenne Tribe ("Tribe"), a federally-recognized Indian tribe located in southeastern Montana, is an intervening party in this case. The Tribe's Reservation's northern boundary is approximately 20 miles from the Colstrip Power Plant, and well over 100 Tribal members work in either the power plant or associated mines. Tribal members also reside off-Reservation in the NorthWestern Energy service area and are rate paying customers. The Tribe sought and was granted intervention based on the interest of off-Reservation, rate-paying members, as well as the economic and social impact of Colstrip Power Plant operations on the Tribe and its members.

The direct testimony provided is from William Walksalong, who is a Tribal member residing on the Reservation and the Tribal Administrator.

<u>Testimony</u>

Q: Hello Mr. Walksalong, can you please inform the Montana Public Service Commission who you are and what experience you have relative to this case?

Mr. Walksalong: Yes. My name is William Walksalong and I am a member of the Northern Cheyenne Tribe. I am a resident of Lame Deer, Montana, on the Northern Cheyenne Tribe's Reservation. I have been heavily involved in Tribal government since 1992. Prior to my current position as the Tribal Administrator I have served as Tribal President, on the Tribal Council, and in other positions. I am knowledgeable with respect to the Tribe's history, government, membership, and conditions on the Reservation.

Q: What is the purpose of your testimony?

Mr. Walksalong: The purpose of my testimony is to provide background regarding the Northern Cheyenne Tribe and its members, and information regarding the impacts to the Northern Cheyenne Tribe and Tribal members from the operation, and potential closure, of the

Colstrip plant. I also propose steps NorthWestern Energy should take to meet its obligation to minimize and compensate for those impacts.

Q: Thank you. Can you please provide background information on the Tribe and the Reservation?

Mr. Walksalong: The Northern Cheyenne Tribe has been a federally-recognized Indian tribe since the Friendship Treaty of 1825. The Tribe's ancestral homelands were first described on "paper" in the Fort Laramie Treaty of 1851. On the northern boundary, they extend from the Pemmican Mountains at the mouth of the Powder River in present-day Montana, east to the confluence of the Missouri and Cannonball rivers in present-day North Dakota. The Rocky Mountain Front marks the western boundary with Pike's Peak, known to the Northern Cheyenne people as Stonehammer Mountain, in the southwestern corner. The Arkansas River forms the southern boundary, and the confluence of the North and South Platte rivers are on the eastern boundary. These homelands include all of the Powder River Basin in present-day Montana and Wyoming.

The Tribe now occupies the Northern Cheyenne Reservation, which is composed of approximately 444,000 acres of land in Big Horn County and Rosebud County, Montana. More than 99 percent of lands within the Reservation are owned by the Tribe or its members and held in trust by the United States. The Tribe also possesses off-Reservation trust lands, including more than 500 acres along the Tongue River Reservoir, in close proximity to the Decker and Spring Creek coal mines in Montana. The Tribe has over 11,000 members, most of whom live on or near the Reservation.

Q: How was the Reservation established?

Mr. Walksalong: The Northern Cheyenne people have a long and proud history of fighting for their homelands in the Powder River Basin. This history is set forth in a report titled *The Northern Cheyenne Tribe and Its Reservation* (Apr. 2002), as well as in the books *A History of the Cheyenne People* by Tom Weist (1977) and *The Northern Cheyenne Indian Reservation, 1877-1900* by Orlan J. Svingen (1993). I will provide a brief summary.

The Northern Cheyenne have been living in southeastern Montana since before contact by white settlers. Beginning in the early 1800s, large numbers of settlers and gold seekers began to move into southeastern Montana. These early settlers and miners brought with them diseases that ravaged large numbers of our people. They also brought European cattle, which began to disrupt the grazing and migration patterns of the buffalo, which the Northern Cheyenne relied on for subsistence and ceremonial purposes. These encroachments, which did not respect the territorial and cultural interests of the Cheyenne and other Indian people, resulted in decades of war.

In the mid-1800s, there were numerous attempts to remove the Northern Cheyenne from our homeland near the Tongue River and relocate them to other parts of the West. For example, the 1851 Treaty of Fort Laramie anticipated the removal of the Cheyenne to lands south of the North Platte River; however, following treaty execution, many Northern Cheyenne people continued to live and hunt in their traditional homeland, leading to escalating conflict and violence in the 1850s. In 1861, the U.S. government again attempted to relocate the Northern Cheyenne to the south, but we refused to abandon our traditional hunting grounds and continued to resist the commercial and military intrusions into their territories. Conflict continued into the 1870s, as the U.S. military sought to open the Cheyenne lands to settlers and gold miners, and the Northern Cheyenne sought to protect their lands and traditions from encroachment. These conflicts include the 1876 Battle at Little Big Horn, where the Northern Cheyenne allied with the Sioux and Arapaho to defeat General George Armstrong Custer and the U.S. Seventh Calvary. They also include the Battle of the Tongue River in 1877 (also known as the Battle of Wolf Mountain), where a group of Northern Cheyenne battled a detachment of the Fifth Infantry in the project area, along the eastern bank of the Tongue River near the present-day location of Birney.

Following these conflicts, many Northern Cheyenne were forcibly relocated to the Oklahoma Territory in 1878 as retribution for our resistance to non-Indian domination and our participation in the Battle of the Little Bighorn. However, we (unlike other relocated tribes) trekked back to our historic homeland in Montana. This journey came at great cost to the Tribe - death, imprisonment, and other deprivations – as we were hounded along the way by thousands of hostile military and settlers.

In 1878, following the relocation to Oklahoma, Chief Dull Knife and Chief Little Wolf led bands of Northern Cheyenne on a long and arduous return trip from Oklahoma to their traditional homeland. In the late 1870s and early 1880s, the Northern Cheyenne began to reestablish themselves in areas near the Tongue River, settling on Lame Deer Creek, Muddy Creek, Rosebud Creek, and the Tongue River between Otter Creek and Hanging Woman Creek. Recognizing the importance of this area to our people, President Arthur signed an executive order on November 16, 1884, establishing the Tongue River Indian Reservation, which at that time did not include lands settled by the Northern Cheyenne on the Tongue River itself. However, in 1900, President McKinley signed an executive order changing the name of our Reservation to the "Northern Cheyenne Reservation" and extending the eastern boundary of our Reservation to its current location on the Tongue River.

Despite establishment of the Reservation, Northern Cheyenne lands and culture remained under threat throughout the 20th century. The early 1900s saw the forced acculturation of my people through federal policies that prohibited or discouraged traditional cultural and religious practices and sent Cheyenne children to boarding schools where they were forbidden to speak their native language.

Through all this hardship, the Cheyenne people have persevered. We are very proud to live on our homelands, and we place a high priority on protecting our lands and waters.

Q: Where do Tribal members work on or near the Reservation, and what are the economic conditions?

Mr. Walksalong: In general, the economy in our area has struggled. Rosebud County, where most of the Reservation and the town of Colstrip are located, was recently designated an "Economic Opportunity Zone" under the 2017 Tax Cuts and Jobs Act, in recognition of ongoing unemployment and poverty. Big Horn County, where the remainder of the Reservation is located, is also designated as an Economic Opportunity Zone.

Within Rosebud County, economic conditions on the Reservation are far worse than off-Reservation. It is very challenging to find work on or near the Reservation. As part of commenting on a proposed railroad near the Reservation, the Tribe commissioned a report from Dr. Thomas Power, which he completed in 2015. While the data may have changed slightly since that time, I believe the identified trends are largely accurate. In comparing on-Reservation conditions to off-Reservation conditions in Rosebud County, Dr. Power noted that:

- The Northern Cheyenne population is much younger when compared with surrounding areas. In Rosebud County, the median age on-Reservation is 23 and off-Reservation is 43.

- The Northern Cheyenne Reservation is much more densely populated. The non-Reservation areas have 1.3 persons per square mile, while the Northern Cheyenne Reservation has a population density of 6.8 persons per square mile.
- The Northern Cheyenne population is much poorer than the population in the surrounding counties. On a per capita basis, in the predominantly white off-Reservation population in Rosebud County, people have 109% higher income per person than their predominantly American Indian neighbors on the Reservation: $12,559 on-Reservation versus $26,271 off-Reservation.
- The unemployment rate on the Reservation is almost 14 times that found off the Reservation in Rosebud County: 27% on-Reservation versus 2% off-Reservation. This is despite the fact that the Northern Cheyenne are overall a well-educated group when compared to Rosebud County and the United States as a whole.

As you can see from these figures, the economy on the Reservation faces challenging circumstances and is fragile. These circumstances leave the Tribe and its members especially vulnerable to changes at Colstrip Power Plant or the associated mines.

Q: What has the Tribe's position been regarding coal development?

Mr. Walksalong: In the Northern Cheyenne religion and culture, land is sacred, and people should not open up the earth. As a result, the Tribe has generally opposed coal mining on its lands. This opposition was solidified in the 1960s and 70s, when coal companies sought to take advantage of the Tribe and gained undermarket leases on the Reservation. It took an act of Congress and a U.S. Supreme Court case, *Northern Cheyenne Tribe v. Hollowbreast*, 425 U.S. 649 (1976), to protect the Reservation from those leases. Since that time, the Tribe has actively sought to ensure mining proposed near the Reservation follows all applicable laws, and that project planners carefully consider impacts to the Tribe and its members.

While the Tribe has historically opposed coal development, the Tribe has also worked closely with owners of the Colstrip Power Plant and associated mines. The Tribe has generally supported operations so long as the owners and operators of the plant and mines follow applicable laws and respect the Tribe's sovereignty. The Colstrip jobs most of all are central to our economy.

Q: How does the Tribe benefit from operation of Colstrip Power Plant and associated mines?

Mr. Walksalong: Well over 100 Tribal members work at the power plant and the mines. I think that this has been a good relationship – the Tribe provides high-quality, local workers, and benefits from generally good union jobs with locally competitive wages.

On the Reservation, each job associated with the Colstrip Power Plant directly supports approximately ten members. This means that the operation of the Power Plant directly benefits more than 1,000 Tribal members (approximately ten percent of the on-Reservation population), and indirectly benefits many more.

These jobs have enormous importance, because they are generally high wage jobs with good benefits, that up until recently have been considered very reliable. Tribal members have received training and certifications, which helps improve the Tribal workforce and provide more opportunities. Plant and mine owners and operators also provide some scholarship opportunities to Tribal members and funding to the Tribe's Department of Environmental Protection and Natural Resources.

Q: How is the Tribe adversely affected by coal mining and operation of the Colstrip Power Plant?

Mr. Walksalong: The Northern Cheyenne Reservation is surrounded by coal mines, including the Western Energy (Rosebud) mine to the North and the Decker and Spring Creek mines to the South. When these mines were under development, they promised opportunities for employment and contracting in Northern Cheyenne reservation communities, but those opportunities never fully materialized.

Coal mining near the reservation impacts tribal communities. Air pollution from mine activities impacts our Class I airshed. Runoff from mines impairs water quality. In particular, runoff from the Decker Mine discharges into the Tongue River, which forms the eastern boundary of the Reservation. Mining destroys habitat for sensitive species, including burrowing owls, prairie dogs, prairie chicken, and sage grouse. Mining within Northern Cheyenne ancestral homelands also destroys important cultural sites, including sites used for Cheyenne ceremonies.

Coal mining near the Reservation brings in workers, which has tended to produce off-Reservation economic benefits while imposing social and economic costs on the Reservation. Outside workers sometimes view the Reservation as a lawless zone and have brought crime, trash, and illegal drugs onto the Reservation. This imposes a significant cost on the Tribal government and harms the quality of life of the Tribe's members.

Operation of the Colstrip Power Plant impacts air quality on the Reservation. The Tribe conducts on-going air quality monitoring. Particularly when scrubbers or other equipment fails, pollutants are registered on the Reservation.

Q: How does this history and context relate to rate setting for NorthWestern Energy?

Mr. Walksalong: The power plant and associated mines have both positive and negative impacts on the surrounding communities. Among those communities, the Tribe and its members are disproportionately reliant on those benefits, and disproportionately harmed by the negative impacts.

My understanding is that a big part of NorthWestern Energy's rate-setting process involves future planning for Unit 4 of the Colstrip Power Plant. Those considerations involve how to plan for potential closure and how to account for the costs of operations, closure, and remediation. The determination of these issues will have an enormous economic and social impact on the Tribe and its members. How NorthWestern approaches potential closure determines how much money it plans on spending, which in turn affects rates.

I am aware that in prior rate-setting cases for Puget Sound Energy and Avista Corp., companies which also own shares of Colstrip Power Plant, there have been substantial settlements that purport to compensate the affected communities for likely plant closure. Despite the unique impacts of closure on the Tribe, the Tribe has been excluded from the bodies that will distribute funds generated by these settlements. At this time, it appears that the Tribe and its members are unlikely to receive any compensation. This is not a feature of whether the Tribe should, as a matter of common sense and fairness, received such funding. The Tribe has been shut out of those processes and have had limited resources to dedicate to this endeavor. For example, despite the Tribe's major stake in the future of the Colstrip plant and mine, we were not invited to be a member of the Governor's Colstrip Community Impact Advisory Group.

Q: What measures do you think NorthWestern Energy should take to compensate the Tribe and its members for the impacts of operation of Colstrip Power Plant, the associated mines, and potential closure of those facilities?

Mr. Walksalong: The most important principle is that companies such as NorthWestern should not be allowed to benefit and profit from operation near the Reservation, and then leave the Tribe and its members to bear the consequences of closure. There must be adequate measures in place to ensure that the Tribe is not disadvantaged by closure. If not, the Tribal economy will likely be devastated by dramatically increased unemployment. Additionally, any struggles in Colstrip are also likely to spread to the Reservation, and the Tribe will have to deal with the social consequences of unemployment. This will lead to increased crime on the Reservation and the Bureau of Indian Affairs law enforcement is severely underfunded and has only a few officers working on our vast Reservation. And we do not have a tax base to help fund law enforcement activities like off-Reservation municipalities enjoy.

While the details require specific negotiation, a plan for closure must seek to do two things: minimize impacts to Tribal members and compensate for the impacts that occur. To minimize environmental impacts, NorthWestern Energy must commit to complete cleanup and remediation of all affected resources, including soil contamination, groundwater contamination, and impacts to surface waters from the power plant and associated mines. This commitment must include setting aside adequate funds now, in the event of bankruptcy or a faster-than-anticipated closure.

To minimize economic impacts, NorthWestern Energy should agree to prioritize Tribal members, particularly those already employed at the power plant or the mine, in jobs associated with closure and remediation. For many years the owners of the Colstrip plant and mine have by contract given employment preference to Tribal members, and that should continue. My understanding is that closure and remediation could take decades and involve ongoing employment. This process should seek to employ as many Tribal members as possible. To the extent specialized skills or new certifications are required, NorthWestern should provide trainings to Tribal members.

NorthWestern should also assist the Tribe and the region to transition to the renewable energy sources that replace coal. The Tribe is in the process of developing potential wind, solar, and biomass electricity generation on the Reservation. NorthWestern should facilitate that development by agreeing to buy power at above-market rates, and by offering greatly reduced transmission costs to outside buyers. These measures would help to jumpstart an industry that promises to provide sustainable jobs for the region into the future.

To compensate for the impacts of operations and closure, NorthWestern should provide funds for the Tribe to facilitate the transition to a new economy. The prior rate-setting cases for Puget Sound Energy and Avista are helpful examples. Avista owns 15% of Unit 3 and 15% of Unit 4, and Avista agreed to a settlement of $4.5 million as part of its acquisition by Hydro One. This amount is proportionate to a larger settlement of approximately $10 million paid by Puget Sound Energy. Because NorthWestern owns 30% of Unit 4, the same overall ownership as Avista, $4.5 million is an appropriate and necessary amount for a settlement fund.

Because the Tribe has been excluded from prior settlement funds, and bears a disproportionate impact from closure, the Tribe should either receive settlement funds directly from NorthWestern Energy or be guaranteed controlling representation on the body that distributes funds. While the Tribe would control these funds, based on past experience, I anticipate they would be used for measures such as scholarships for Tribal members and startup capital for businesses owned by the Tribe or its members.

I strongly believe that with appropriate planning and resources, a strong economy on the Reservation will help fuel a strong economy in Rosebud County.

Q: Thank you. Do you have any further thoughts?

Mr. Walksalong: That completes my direct testimony in this matter.

Respectfully submitted on this 12th day of February, 2019.

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On behalf of Intervenor the Northern Cheyenne Tribe

CERTIFICATE OF SERVICE

I hereby certify that on the 12th day of February, 2019, I served *The Northern Cheyenne Tribe Intervenor Testimony from Mr. William Walksalong, Tribal Administrator*, by first-class mail, postage prepaid, and electronic mail, unless otherwise noted, on the following:

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DarAnne Dunning

DarAnne Dunning

Exhibit C

Declaration of President Serena K. Wetherelt

-WOHEHIV-
The Morning Star

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-WOHEHIV-
The Morning Star

August 28, 2023

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Via Reddi.mt.gov and email to pschelp@mt.gov

RE: Docket No. 2022.11.102 - NorthWestern Energy 2023 Integrated Resource Plan
Comments of the Northern Cheyenne Tribe

Dear Mr. Rosquist:

The Northern Cheyenne Tribe submits these comments on NorthWestern Energy's 2023 Integrated Resource Plan to highlight the significant opportunity for cost-effective investments in reliable clean energy development on Tribal land. The Northern Cheyenne Tribe has determined that responsible development of the Northern Cheyenne Tribe's renewable energy resources can provide for economic development of such resources in a manner that maximizes the benefits to the Tribe and is consistent with the Tribe's traditional, cultural, and environmental values. And while clean energy development on the Reservation benefits the Tribe and its members, investment by NorthWestern Energy in such development would additionally provide economic opportunities to the communities near the Reservation, as well as extraordinary benefit to the utility's Montana electric customers. At the same time, NorthWestern's plan to expand its reliance on Colstrip power would harm the Tribe without providing corresponding economic and environmental benefits.

The Tribe asks the Commission to require NorthWestern to modify its plan to ensure that clean-energy resources developed on the Northern Cheyenne Reservation are given appropriate consideration.

<u>Background</u>

The Northern Cheyenne Tribe is a federally recognized Tribe headquartered on the 440,000-acre Northern Cheyenne Indian Reservation in present-day southeastern Montana, approximately twenty miles from Colstrip, Montana and the Colstrip coal-fired power plant. In addition to the power plant, the Reservation is near to the Rosebud and Spring Creek coal mines, as well as the Decker coal mine, which closed in 2021 due to declining demand for coal. Approximately 5,000 Tribal members live on the reservation, many of whom are employed or supported by family members who are employed by the power plant or area coal mines.

Despite the employment of some Tribal members in coal energy projects, the coal industry has not brought economic prosperity to the Tribe. The ongoing need for Tribal economic development is now combined with the reality of declining employment of Tribal members in coal industries as demand across the country has decreased.

Beginning in 2016, the Northern Cheyenne Tribe has prioritized pursuing sustainable energy development as an important opportunity to build revenues to fund Reservation-wide weatherization and energy assistance as well as workforce training programs. Building on a long history of environmental protection, interest in clean energy sources, and efforts to preserve the Cheyenne traditional way of life, the Tribe launched a sustainable energy development initiative to promote a resilient and diversified new "green energy" economy. To further these efforts, in 2017, the Tribe created a full-time Renewable Energy Manager staff position and the Sustainable Energy Committee—a subcommittee of the Tribal Council dedicated to evaluating and pursuing renewable energy development.

The Tribe is currently focused on the commercial development of renewable energy as a key building block for a sustainable energy future. The Northern Cheyenne Reservation is well-suited for small and large-scale renewable energy development because it possesses excellent sustainable energy resources, almost all of the land is held in trust for the Tribe and its members, and the Reservation is located near a major energy system in Colstrip through which power can be transmitted to power purchasers such as large utilities and commercial entities.

To facilitate these efforts, Tribe is preparing a Request for Proposals ("RFP") for renewable energy development on the Reservation to be issued shortly. Additionally, the Tribal Council, staff and contractors engaged in a process to identify areas of the Northern Cheyenne Reservation suitable and preferred for renewable energy development, albeit not necessarily the exclusive areas for such development. These efforts demonstrate the realistic prospect that Tribal clean energy projects will be able to deliver significant energy and capacity to NorthWestern and its customers in the near future.

The Tribe has consulted with numerous stakeholders, including the U.S. Department of Energy (DOE) Office of Indian Energy, National Renewable Energy Laboratory, Western Area Power Administration, Basin Electric, regional utilities, and Tongue River Electric Cooperative. However, to date, NorthWestern Energy has not meaningfully engaged with the Tribe to discuss potential future investment in Tribal energy resources.

The IRP Does Not Address Significant Economic and Technological Benefits of Renewable Energy Development on the Northern Cheyenne Reservation.

NorthWestern's IRP discounts clean energy resources as significant contributors to the utility's overall energy needs without accounting for the substantial economic and technological and benefits of purchasing clean energy generated on the Northern Cheyenne Reservation.[1]

First, the increasing affordability of wind, solar, and storage resources is enhanced by developing such resources on the Northern Cheyenne Reservation. NorthWestern's analysis did not account for the bonuses for development within an energy community and on Tribal land. Under the Inflation Reduction Act, the Northern Cheyenne Reservation is an energy community because it is within an area that has historically been at the forefront of fossil-fuel energy production.[2] Therefore projects located on the Reservation qualify for a 10 percent increase of both the Investment Tax Credit (ITC) and the Production Tax Credit (PTC).[3] And the Inflation Reduction Act further increases the ITC by 10 percentage points for projects located on Indian land.[4] A project located on the Northern Cheyenne Reservation would be eligible for both bonus credits, increasing the incentive by 20 percentage points above the standard 30 percent credit. This could significantly reduce the cost of battery storage and clean energy generating resources available to NorthWestern.[5] Furthermore, development may be streamlined on the Reservation because the Tribe has approved leasing and environmental review regulations under Tribal law.

Second, because of the Reservation's proximity to the Colstrip coal plant, clean energy resources located on the Reservation could readily use available capacity on the Colstrip Transmission System. As explained in the analysis provided by Michael Goggin, interconnection of a diverse mix of wind, solar, and storage resources to the Colstrip Transmission System could reduce or eliminate the need for NorthWestern to invest $20-30 million for the installation of reactive power devices to regulate voltage on the system.

The Tribe requests that the Commission require NorthWestern to properly account for these economic and technological advantages of purchasing clean energy from on-Reservation solar, wind, and storage resources. All told, these benefits would provide substantial benefits to NorthWestern and its customers.

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[1] *E.g.* IRP at 23 ("The technologies needed to reach this [100% clean energy] goal sooner are not currently available in a manner that is cost effective for our company or our customers.").

[2] Rosebud and Big Horn Counties, in which the Northern Cheyenne Reservation is located, are "Energy Communities" as defined by the Inflation Reduction Act. *See* https://www.irs.gov/pub/irs-drop/n-23-29-appendix-c.pdf

[3] Public Law 117–169, 136 Stat. 1921, §§ 13101, 13102, 13701, 13702 (Aug. 16, 2022)

[4] *Id.* § 13702 (Aug. 16, 2022) (providing 10 percent in additional credits for facilities located in low-income communities or on Indian land).

[5] Moreover, as described in the memorandum prepared by Michael Goggin, the IRP significantly overstates the typical cost of wind and solar resources and understates the value of the general PTC for both wind and solar, which could reduce capital costs far more than the 30 percent that NorthWestern assumed. *See also* IRP Volume 1, at 63 (explaining that the PTC is more valuable than the 30% ITC for solar resources).

The IRP Does Not Address Equitable Distribution of the Costs and Benefits of Energy Production

NorthWestern should be required to revise its IRP to address how the company will ensure that the environmental and economic costs and benefits of energy production are equitably distributed, where costs have fallen disproportionately on the Northern Cheyenne Tribe and its members. Under the pre-2023 planning rules that NorthWestern is applying in this planning process, least-cost resource plans must, among other things, "minimize the environmental and other external costs not incorporated into the formal cost analysis" and "distribute costs and benefits in an equitable manner." ARM 38.5.2007(1)(c), (e) (2022). NorthWestern's draft IRP does not minimize the environmental and external costs and, importantly, does not identify plans to ensure that the costs and benefits are equitably distributed to the Northern Cheyenne Tribal community.

The Northern Cheyenne Tribe bears disproportionate harm from NorthWestern's continued reliance on coal-powered electricity generation. The Northern Cheyenne Reservation is twenty miles from the Colstrip coal-fired power plant—partially owned by NorthWestern Energy—and its associated coal mine. Since the Colstrip plant was first proposed, the Tribe has taken steps to protect its people from the harmful effects of air pollution from the plant. For example, concerned about the proposed construction of Colstrip Units 3 and 4, in 1976 the Tribe proposed to redesignate the Reservation as a Class I airshed under the Clean Air Act. After EPA approved the Tribe's proposal in 1977, the Tribe exercised its authority to require additional air pollution controls on the new Colstrip units. However, now NorthWestern Energy is opposing new federal rules that would limit the plant's emissions of hazardous air pollutants—pollution that impairs brain development, increases cancer risks, and contributes to other chronic and acute health disorders.[6] Because of the proximity of the Northern Cheyenne Tribal members to the Colstrip plant—living both on the Reservation and in the nearby community of Colstrip, where many Tribal members are employed—they are disproportionately impacted by exposure to hazardous air pollutants. If NorthWestern is going to continue relying on Colstrip, it must stop resisting the installation of the same air pollution controls that other plants across the country have already installed to protect local communities from toxic emissions.

Coal mining at the Rosebud strip mine also harms our Tribal community. Air pollution from mine activities impacts our Class I airshed. Mine runoff impairs water quality. Mining destroys habitat for sensitive species, including burrowing owls, prairie dogs, prairie chicken, and sage grouse. And even when coal mines use the best reclamation practices to restore the land, mining has caused long-term harm to our environment.

In addition to these health and environmental impacts, the power plant and mine bring new people to the Reservation, along with drugs, human trafficking, and other crime. These challenges disrupt our culture and strain Tribal infrastructure, schools, and law enforcement and

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[6] *See* NorthWestern Corporation Comments re: Proposal on National Emissions Standards for Hazardous Air Pollutants: Coal and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review (June 23, 2023), https://downloads.regulations.gov/EPA-HQ-OAR-2018-0794-5980/attachment_1.pdf.

fire-fighting personnel and equipment. At the same time, the Tribe has not seen significant economic benefit from our neighboring industries.

NorthWestern Energy proposes in its IRP to increase its reliance on Colstrip into the future, extending the burden on the Tribe, but the company has not proposed to mitigate these harms or generate any benefits owed to the Tribe. In addition to reducing or eliminating significant pollution from Colstrip and the Rosebud Mine, NorthWestern must consider opportunities to generate economic and environmental benefits to the Tribe through purchases of clean energy generated on the Northern Cheyenne Reservation.

Conclusion

NorthWestern Energy has an opportunity to invest in Tribal clean energy projects that would provide affordable energy and capacity for NorthWestern customers and more equitably distribute the costs and benefits of its energy system. The Commission should require NorthWestern to revise its IRP to fully consider this opportunity.

Sincerely,

Serena K. Wetherelt

Serena K. Wetherelt
President

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

STATE OF NORTH DAKOTA, STATE OF WEST VIRGINIA, et al., Petitioners, v. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, Respondent.	Case No. 24-1119 (and consolidated cases)

DECLARATION OF JAMES A. ZELLMER

I, James A. Zellmer, state and declare as follows,

I. Purpose of this declaration.

1. I am the Division Administrator for the Environmental Management Division of the Wisconsin Department of Natural Resources (DNR), which is the agency charged with implementation of the Clean Air Act, Clean Water Act, and wildlife management in the State of Wisconsin. The Environmental Management Division includes the Air Management, Drinking Water & Groundwater, Office of Great Waters, Remediation & Redevelopment, Waste & Materials Management, and Water Quality programs.

2. I submit this declaration on behalf of the State of Wisconsin in opposition to the motions to stay the final rule of the Environmental Protection Agency ("EPA"), 89 Fed. Reg. 38,508 (May 7, 2024), entitled "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review," (Mercury and Air Toxics Standards (MATS) RTR). That final action, taken pursuant to section 112 of the Clean Air Act, 42 U.S.C. 7412(d)(6), strengthens the MATS, 77 Fed. Reg. 9304 (Feb. 12, 2012), by increasing the limits on lignite coal-fired power-plant emissions of mercury and all coal-fired power plant emissions of hazardous non-mercury metals. As this declaration will describe, the challenged rule will protect the public health of Wisconsin residents by decreasing their exposure to mercury and other hazardous air pollutants and will protect the state's natural resources from the dangers of power-plant mercury emissions.

II. Experience and qualifications.

3. This declaration is based upon my experience and professional background. I have been employed by the DNR for 35 years. I have spent 15 years in leadership positions within DNR, serving as Division Administrator for the Environmental Management Division for the last two years, overseeing most of the agency's water programs, as well as the waste, air, and environmental cleanup programs. I hold a bachelor's degree in water resources from the University of

Wisconsin-Stevens Point and a master's degree in civil and environmental engineering from the University of Wisconsin.

III. Mercury is hazardous and contamination is widespread in Wisconsin.

4. Mercury is a hazardous material that causes serious environmental and human health problems. Although it is found naturally, it is most often released from man-made products or produced as a by-product of energy production. Wisconsin is particularly concerned about the release of mercury to the atmosphere through coal-fired utility emissions because the mercury can be deposited into waterbodies located at remote distances from the original source of the emissions. Once mercury is released into the environment, it can convert to a toxic compound called methylmercury that can contaminate fish and harm people who eat fish.

5. Mercury is a bio-accumulative pollutant, which means that it does not break down over time and accumulates in animal tissues. If mercury is continually ingested it can build up to toxic levels. Mercury becomes even more hazardous to organisms higher in the food chain because it biomagnifies. Biomagnification is the incremental increase in a contaminant's concentration at each level of the food chain.

6. Human-health effects associated with methylmercury include severe neurological disorders in infants exposed during pregnancy. Children exposed to mercury may suffer from developmental problems and damage to the kidneys and digestive system. The nervous system is very sensitive to all forms of mercury.

Symptoms include irritability, shyness, tremors, changes in vision or hearing, and memory problems. Exposure to mercury vapors can cause effects such as lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

7. Waterways and fisheries are important resources to Wisconsin and its citizens. DNR has been working to assess mercury contamination in the state's freshwater fish for 50 years in order to evaluate the extent of mercury contamination in Wisconsin's waters and reduce the health risks to the public from consumption of mercury-contaminated fish.

8. Mercury contamination of Wisconsin's waterbodies is a serious problem. The state has listed 139 waters as impaired due to mercury under Clean Water Act section 303(d), meaning those waters are unable to support designated uses such as fishing, swimming, or aquatic life. *See* 33 U.S.C. § 1313(d). Out of the 139 mercury-impaired waters, 120 are impaired by the atmospheric deposition of mercury. Out of those 120 waters impaired by the atmospheric deposition of mercury, 119 are impaired *solely* by the atmospheric deposition of mercury.

9. Wisconsin lakes and rivers are public resources, owned in common by all Wisconsin citizens under the state's Public Trust Doctrine. Written in the state constitution in article IX, section 1, the Public Trust Doctrine declares that all navigable waters are "common highways and forever free" and held in trust by the

State of Wisconsin. Therefore, the mercury-impairment of lakes and rivers is an impact to public resources.

10. A number of the mercury-impaired waters are located within or adjacent to state-owned properties. Some mercury-impaired waters located completely within state-owned lands include Mauthe Lake in the Kettle Moraine State Forest—Northern Unit; High Falls Reservoir in the Governor Earl Peshtigo River State Forest; Hemlock Lake in the American Legion State Forest; and Shannon Lake, North Bass Lake, White Birch Lake, and Irving Lake, all located within the Northern Highland State Forest.

11. DNR began monitoring mercury residues in fish in 1970, initially focusing on addressing areas with mercury-impacted wastewater discharges. Wisconsin began issuing mercury-based advisories in 1985 after DNR found high levels of mercury in predator species of fish from northern lakes remote from any direct discharger or emitter of mercury, indicating atmospheric deposition of mercury in those lakes. In 2001, Wisconsin adopted a statewide mercury advisory after the National Research Council and EPA determined there was a need to better protect fetuses and young children from mercury exposure.

12. Since the inception of the fish mercury monitoring program in 1970, Wisconsin has tested more than 42,000 fish tissue samples for mercury. Approximately 40% of those samples have shown mercury concentrations greater

than 0.3 mg Hg/kg wet weight, EPA's fish tissue criterion for the protection of human health. As a result, DNR maintains the statewide advisory which warns pregnant women and children to avoid eating certain types of fish due to mercury contamination, as well as separate mercury-related advisories for all 120 of the individual Wisconsin waterbodies impaired by atmospheric deposition of mercury.

13. In addition to fish monitoring, Wisconsin began monitoring wildlife for mercury in the early 1980s. Elevated levels of mercury and potential adverse effects have been documented in several species including common loons, bald eagles, and river otter. In addition, Wisconsin has a mercury-based consumption advisory for ducks harvested from the lower Fox River and the Bay of Green Bay.

14. Tribal populations may be disproportionately affected by mercury contamination. Fish and fishing are of great cultural importance to Wisconsin tribes, and Wisconsin tribal members consume 60% more walleye on average than the general population. Walleye are top predators that bioconcentrate mercury and their contamination is the basis for mercury-related fish consumption advisories in place for 74 Wisconsin waterbodies.

IV. Wisconsin has made substantial efforts to reduce mercury contamination of its waters and natural resources.

15. DNR expends significant resources to monitor fish mercury levels. In addition to staff resources to collect the fish, the cost of mercury analysis is approximately $20,000 annually. Because atmospheric mercury

deposition—including from coal-fired power plants—is the dominant source of mercury contamination in state waters, these costs of DNR's monitoring program have been driven, in substantial part, by that pollution.

16. Wisconsin has worked for decades to reduce the widespread mercury contamination in its waterbodies and natural resources. DNR first promulgated an air toxics rule in 1988 which required sources of air emissions to limit emissions of air toxics, including mercury. In 2004, the state promulgated a rule to specifically control mercury emissions from coal combustion. This rule required coal-fired utilities to reduce mercury emissions by 40% by 2010 and by 90% by 2015, or to meet a specific mercury emission limit. Some large utilities were allowed to choose a multi-pollutant alternative which delayed the mercury compliance deadline if the affected power plant also achieved nitrogen oxides (NOx) and sulfur dioxide (SO_2) reductions beyond current federal and state regulations. The implementation of this Wisconsin rule and the 2012 MATS Rule have contributed to a significant decrease in mercury air emissions in Wisconsin. By 2022, mercury air emissions from sources in Wisconsin had declined to 448.53 pounds compared to 4,551 pounds emitted in 2004.

17. Despite these measures, the monitoring data showed and continue to show that fish mercury levels in many Wisconsin waterbodies are too high for

human consumption, requiring fish-consumption advisories to remain in place across the state.

V. The federal controls on mercury required by the MATS Rule are needed to make Wisconsin's waters safe from mercury pollution.

18. Mercury pollution is carried by the wind across state borders and is a contributing source of the mercury loading to Wisconsin's waterbodies. Federal controls on mercury air emissions—and regular strengthening of those standards as warranted by existing, feasible control technologies, such as those identified in the MATS RTR—are therefore an important part of a strategy to reduce mercury deposition to Wisconsin's waters.

19. EPA's final rule strengthens controls on plants in the Midwest region. Wisconsin is a member of The Great Lakes Commission and has a shared interest with other member states in supporting efforts to reduce mercury emissions and mercury deposition in the Great Lakes-St. Lawrence River region.

20. Without the federal limits mandated by the MATS Rule and the MATS RTR, power plants may be permitted to turn off their mercury controls and once again emit large quantities of mercury to the air.

21. In turn, those increased mercury air emissions would result in increased mercury contamination in Wisconsin waterbodies and undermine the substantial investments Wisconsin has made over the last decades to reduce mercury contamination.

I declare that to the best of my knowledge, under the penalty of perjury under the laws of the United States, that the foregoing is true and correct.

Executed on July 17, 2024, at Madison, Wisconsin.

JAMES A. ZELLMER