ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 63

[EPA–HQ–OAR–2018–0794; FRL–6716.2–02–OAR]

RIN 2060–AV12

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

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final action.

SUMMARY: After consideration of public comments, the EPA is revoking a May 22, 2020 finding that it is not appropriate and necessary to regulate coal- and oil-fired electric utility steam generating units (EGUs) under Clean Air Act (CAA) section 112, and concluding, as it did in its April 25, 2016 finding, that it remains appropriate and necessary to regulate hazardous air pollutant (HAP) emissions from EGUs after considering cost.

DATES: This final agency action is effective March 6, 2023.

ADDRESSES: The EPA has established a docket for this rulemaking under Docket ID No. EPA–HQ–OAR–2018–0794. All documents in the docket are listed in *https://www.regulations.gov/.* Although listed, some information is not publicly available, *e.g.,* Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the internet and will be publicly available only in hard copy. With the exception of such material, publicly available docket materials are available electronically in *https://www.regulations.gov/* or in hard copy at the EPA Docket Center, Room 3334, WJC West Building, 1301 Constitution Avenue NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the EPA Docket Center is (202) 566–1742.

FOR FURTHER INFORMATION CONTACT: For questions about this action, contact Melanie King, Sector Policies and Programs Division (D243–01), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711; telephone number: (919) 541–2469; and email address: *king.melanie@epa.gov.*

SUPPLEMENTARY INFORMATION: The EPA is revoking a May 22, 2020 (85 FR 31286) finding that it is not appropriate and necessary to regulate coal- and oil-fired EGUs under CAA section 112 (2020 Final Action), and concluding, as it did in the EPA's April 25, 2016 finding (81 FR 24420), that it remains appropriate and necessary to regulate HAP emissions from EGUs after considering cost. The 2016 finding was made in response to the U.S. Supreme Court's 2015 *Michigan* v. *EPA* decision, where the Court held that the EPA had erred by not taking cost into consideration when taking action on February 16, 2012 (77 FR 9304), to affirm a 2000 EPA determination that it was appropriate and necessary to regulate HAP emissions from EGUs. In the same 2012 action, the EPA also promulgated National Emission Standards for Hazardous Air Pollutants (NESHAP) for coal- and oil-fired EGUs, commonly known as the Mercury and Air Toxics Standards or MATS. The EPA is taking this action after a review of the public comments on our proposed revocation of the 2020 Final Action and our conclusion that it is appropriate and necessary to regulate coal- and oil-fired EGUs under CAA section 112 (2022 Proposal), based, in part, on ''screening-level'' analyses contained in the 2021 Risk Technical Support Document (TSD) [1] and a reassessment of the actual costs of MATS implementation in the Cost TSD.[2] See 87 FR 7624 (February 9, 2022). A summary of the public comments and the EPA's responses to the comments, and the TSDs are available in the docket for this action, Docket ID No. EPA–HQ–OAR–2018–0794.[3]

Based on a re-evaluation of the administrative record and the statute, and after considering public comments, the EPA concludes that the framework applied in the May 22, 2020 finding was ill-suited to assessing and comparing the full range of advantages and disadvantages, and after applying a more suitable framework, the 2020 determination is revoked. Additionally, the EPA is reaffirming that it is appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs after weighing the volume of pollution that would be reduced through regulation, the public health risks and harms posed by these emissions, the impacts of this pollution on particularly exposed and sensitive populations, the availability of effective controls, and the costs of reducing this harmful pollution, including the effects of control costs on the electricity generation industry and its ability to provide reliable and affordable electricity.

Preamble acronyms and abbreviations. We use multiple acronyms and terms in this preamble. While this list may not be exhaustive, to ease the reading of this preamble and for reference purposes, the EPA defines the following terms and acronyms here:

ARP Acid Rain Program
BCA benefit-cost analysis
CAA Clean Air Act
CAAA Clean Air Act Amendments of 1990
CAMR Clean Air Mercury Rule
CBI Confidential Business Information
CDC Centers for Disease Control and Prevention
CFR Code of Federal Regulations
C–R concentration response
DSI dry sorbent injection
EGU electric utility steam generating unit
EIA Energy Information Administration
EJ environmental justice
EPA Environmental Protection Agency
ESP electrostatic precipitator
FGD flue gas desulfurization
FR Federal Register
HAP hazardous air pollutant(s)
HCl hydrogen chloride
HF hydrogen fluoride
IHD ischemic heart disease
IPM Integrated Planning Model
IRIS Integrated Risk Information System
MACT maximum achievable control technology
MATS Mercury and Air Toxics Standards
MI myocardial infarction

[1] *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—Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding; Notice of Proposed Rulemaking.* Available in the rulemaking docket, Docket ID No. EPA–HQ–OAR–2018–0794–4605.

[2] *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.* Available in the rulemaking docket, Docket ID No. EPA–HQ–OAR–2018–0794–4586.

[3] As explained in a memorandum to the docket, the docket for this action includes the documents and information, in whatever form, in Docket ID Nos. EPA–HQ–OAR–2009–0234 (National Emission Standards for Hazardous Air Pollutants for Coal- and Oil-fired Electric Utility Steam Generating Units), EPA–HQ–OAR–2002–0056 (National Emission Standards for Hazardous Air Pollutants for Utility Air Toxics; Clean Air Mercury Rule (CAMR)), and Legacy Docket ID No. A–92–55 (Electric Utility Hazardous Air Pollutant Emission Study). See memorandum titled *Incorporation by reference of Docket Number EPA–HQ–OAR–2009–0234, Docket Number EPA–HQ–OAR–2002–0056, and Docket Number A–92–55 into Docket Number EPA–HQ–OAR–2018–0794* (Docket ID Item No. EPA–HQ–OAR–2018–0794–0005).

MW megawatt
NAS National Academy of Sciences
NESHAP national emission standards for hazardous air pollutants
NHANES National Health and Nutrition Examination Survey
OMB Office of Management and Budget
PM particulate matter
RfD reference dose
RIA regulatory impact analysis
RTR residual risk and technology review
SCR selective catalytic reduction
SO_2 sulfur dioxide
the Court U.S. Supreme Court
the court D.C. Circuit Court
TSD technical support document
tpy tons per year

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I. General Information

A. Executive Summary

On January 20, 2021, the President signed Executive Order 13990, ''Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis'' (86 FR 7037, January 25, 2021). The Executive order, among other things, instructed the EPA to review the 2020 final action titled ''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 FR 31286; May 22, 2020) (2020 Final Action) and to consider publishing a notice of proposed rulemaking suspending, revising, or rescinding that action. Consistent with the Executive order, the EPA has undertaken a careful review of the 2020 Final Action, in which the EPA reconsidered its April 25, 2016 supplemental finding (81 FR 24420) (2016 Supplemental Finding). Based on that review, on February 9, 2022, the EPA issued a proposed action finding that the decisional framework for making the appropriate and necessary determination under CAA section 112(n)(1)(A) that was applied in the 2020 Final Action was unsuitable because it failed to adequately account for statutorily relevant factors (87 FR 7624). The EPA proposed to revoke the 2020 Final Action's determination that it is not appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs under section 112 of the CAA and to reaffirm our earlier determinations—made in 2000 (65 FR 79825; December 20, 2000) (2000 Determination), 2012 (77 FR 9304; February 16, 2012) (2012 MATS Final Rule), and 2016—that it is appropriate and necessary to regulate coal- and oil-fired EGUs under section 112 of the CAA. After considering the public comments on the 2022 Proposal, the EPA is finalizing its revocation of the 2020 Final Action and its reaffirmation of the earlier determinations that it is appropriate and necessary to regulate coal- and oil-fired EGUs under section 112 of the CAA.

In this action, we conclude that the methodology we applied in 2020 is ill-suited to the appropriate and necessary determination because, among other reasons, it did not give adequate weight to the significant volume of HAP emissions from EGUs and the attendant risks remaining after imposition of the other requirements of the CAA, which includes risks of many adverse health and environmental effects of EGU HAP emissions that currently cannot be quantified or monetized. We therefore revoke the 2020 Final Action.

We further conclude, once again, that it is appropriate and necessary to regulate coal- and oil-fired EGUs under CAA section 112. We come to this conclusion by first examining the advantages of regulation, including new information on the risks posed by EGU HAP emissions. We then examine the disadvantages of regulation, including both the costs of compliance (which we explain we significantly overestimated in 2012) and how those costs affect the industry and the public. We then weigh these advantages and disadvantages to reach the conclusion that it is appropriate and necessary to regulate, using two separate methodologies.

Our preferred methodology is to consider *all* of the impacts of the regulation using a totality-of-the-circumstances approach rooted in the *Michigan* court's direction to ''pay[] attention to the advantages *and* disadvantages of [our] decision[].'' 576 U.S. at 753; see *id.* at 752 (''In particular, 'appropriate' is 'the classic broad and all-encompassing term that naturally and traditionally includes consideration of all the relevant factors.''). To help determine the relevant factors to weigh, we look to CAA section 112(n)(1)(A), the other provisions of CAA section 112(n)(1), and to the statutory design of CAA section 112.

Initially, we consider the human health advantages of reducing HAP emissions from EGUs because, in CAA section 112(n)(1)(A), Congress directed the EPA to make the appropriate and necessary determination after considering the results of a ''study of the hazards to public health reasonably anticipated to occur as a result of [HAP] emissions'' from EGUs. See CAA section 112(n)(1)(A). We consider all of the advantages of reducing emissions of HAP (*i.e.,* the risks posed by HAP) regardless of whether those advantages can currently be quantified or monetized in a way that allows the benefits of such action to be directly compared to the costs of reducing those emissions. Consistent with CAA section 112(n)(1)(B)'s direction to examine the rate and mass of mercury emissions, and the design of CAA section 112, which requires swift reduction of the volume of HAP emissions from stationary

sources based on the risk such emissions pose, we conclude that we should place substantial weight on reducing the large volume of HAP emissions from EGUs, thereby reducing the risk of grave harms that can occur as a result of exposure to HAP. Also consistent with the statutory design of CAA section 112, in considering the advantages of HAP reductions, we consider the distribution of risk reductions, and the statute's clear goal in CAA section 112(n)(1)(C) and other provisions of CAA section 112 to protect the most exposed and susceptible populations, such as developing fetuses and communities that are reliant on local fish for their survival. We think it is highly relevant that, while EGUs generate power for all, and EGU HAP emissions pose risks to anyone exposed to such HAP, a smaller set of the population who live near EGUs face a disproportionate risk of being significantly harmed by toxic pollution. Finally, we also consider the identified risks to the environment posed by mercury and acid-gas HAP, consistent with CAA section 112(n)(1)(B) and the general goal of CAA section 112 to reduce risks posed by HAP to the environment.

We next weigh those advantages against the disadvantages of regulation, principally in the form of the costs incurred to control HAP before they are emitted into the environment. In evaluating the disadvantages of MATS, we begin with the costs to the power industry of complying with MATS. This assessment uses a sector-level (or system-level) accounting perspective to estimate the cost of MATS, looking beyond just pollution control costs for directly affected EGUs to include incremental costs associated with changes in fuel supply, construction of new capacity, and costs to non-MATS units that were also projected to adjust operating decisions as the power system adjusted to meet MATS requirements. Consistent with the statutory design, we consider those costs comprehensively, examining them in the context of the effect of those expenditures on the economics of power generation more broadly, the reliability of electricity, the cost of electricity to consumers, and employment effects. These metrics are relevant to our weighing exercise because they give us a more complete picture of the disadvantages to producers and consumers of electricity imposed by this regulation and because our conclusion might change depending on how this burden affects the ability of the industry to provide reliable, affordable electricity. These metrics are relevant measures for evaluating costs to the utility sector in part because they are the types of metrics considered by the owners and operators of EGUs themselves. See 81 FR 24428 (April 25, 2016).

As explained in detail in this final action, after weighing the risks posed by HAP emissions from EGUs against the costs of reducing that pollution on the industry and society as a whole, we conclude that it is appropriate to regulate those emissions to protect against adverse health and environmental impacts posed by exposure to HAP emitted by coal- and oil-fired EGUs. We note it is particularly important to regulate because of the risks of adverse health impacts on the populations most vulnerable to such risks. We find that this is true whether we are looking at the information available as of the time of the 2012 threshold finding (as reflected in the rulemaking record for the 2016 Supplemental Finding) or as of the time of the updated record in 2022, in which we quantify additional risks posed by HAP emissions from EGUs and determine, based on newer post-MATS implementation analyses, that the actual cost of complying with MATS was likely significantly less than the EPA's projected estimate in the 2011 Regulatory Impacts Analysis (2011 RIA).[4] We find the actual cost of complying with MATS was likely significantly less than the EPA's projected estimate in the 2011 RIA primarily because fewer pollution controls were installed than projected, and the controls that were used were less expensive than projected.

We conclude that regulation is appropriate under our preferred totality-of-the-circumstances approach when we consider the advantages and disadvantages associated with reducing HAP emissions alone, even when excluding consideration of the many advantages arising from reductions in non-HAP emissions which occur when reducing HAP emissions. However, a true examination of all of the ''advantages *and* disadvantages of [our] decision[],'' 576 U.S. at 753 (emphasis in original), would include such non-HAP beneficial impacts. Therefore, while we would find MATS regulation appropriate and necessary when focusing solely on HAP, in this rulemaking, we also considered the advantages associated with non-HAP emission reductions that result from the application of HAP controls as part of our totality-of-the-circumstances approach. In the 2012 MATS Final Rule, our projections found that regulating EGUs for HAP would result in substantial health benefits from coincidental reductions in ambient concentrations of particulate matter (PM). We also projected that regulating EGUs for HAP would similarly result in an improvement in ambient concentrations of ozone. While we reach the conclusion that regulating HAP emissions from coal- and oil-fired EGUs is appropriate even absent consideration of these additional benefits, adding these advantages to the weighing inquiry provides further support for our conclusion that the advantages of regulation outweigh the disadvantages.

We recognize, as we did in 2016, that our preferred, totality-of-the-circumstances approach to making the appropriate and necessary determination is an exercise of judgment, and that ''[r]easonable people, and different decision-makers, can arrive at different conclusions under the same statutory provision.'' 81 FR 24431; April 25, 2016. However, this type of weighing of factors and circumstances is an inherent part of regulatory decision-making, and the EPA finds it is a reasonable approach in this case.

Next, we turn to our alternative approach of a formal benefit-cost analysis (BCA). This approach independently supports the determination that it is appropriate to regulate EGU HAP. Based on the 2011 RIA performed as part of the 2012 MATS Final Rule, the total net benefits of MATS were overwhelmingly positive even though the EPA was only able to quantify and monetize a subset of the many societal benefits of reducing HAP emissions from EGUs. Like the preferred approach, this conclusion is further supported by newer information on the risks posed by HAP emissions from EGUs as well as new information on the actual costs of implementing MATS, which likely were significantly overestimated in the 2011 RIA.

This final action is organized as follows. In section II.A of this preamble, we provide as background the regulatory and procedural history leading to this action. We also detail, in preamble section II.B, the statutory design of HAP regulation that Congress added to the CAA in 1990 in the face of the EPA's failure to make meaningful progress in regulating HAP emissions from stationary sources. In particular, we point out that many provisions of CAA section 112 demonstrate the value Congress placed on reducing the volume

[4] U.S. EPA. 2011. *Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards.* EPA–452/R–11–011. Available at: *https://www3.epa.gov/ttn/ecas/docs/ria/utilities_ria_final-mats_2011-12.pdf.*

of HAP emissions from stationary sources as much and as quickly as possible, with a particular focus on reducing HAP related risks to the most exposed and most sensitive members of the public. This background assists in identifying the relevant statutory factors to weigh in considering the advantages and disadvantages of HAP regulation.

Section III of the preamble provides a brief summary of the 2022 Proposal's findings. In section III.A, we review the public health and environmental burden associated with EGU HAP emissions by summarizing information previously recognized and documented in the statutorily mandated CAA section 112(n)(1) studies, as well as additional risk analyses supported by new scientific studies introduced in the 2022 Proposal. Section III.B considers the costs of the MATS regulation and describes the basis for the EPA's conclusion that the original cost projection in the 2011 RIA was likely a significant overestimate of the actual cost. These two sections establish the foundation for the EPA's rationale for both revoking the 2020 Final Action and affirming our determination that regulation of HAP emissions from coal- and oil-fired EGUs is appropriate and necessary in light of advantages and disadvantages using our preferred totality-of-the-circumstances approach. The revocation of the 2020 Final Action is discussed in section III.C, and the Administrator's preferred totality-of-the-circumstances approach is presented in section III.D. In section III.E, we describe our alternative approach to the appropriate and necessary determination which applies a formal BCA and that independently supports the appropriate and necessary determination. Finally, in section III.F, we present the Administrator's final determination that it is appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs after considering cost.

The EPA provided opportunities for public comment on our proposed revocation of the 2020 Final Action and our affirmation that it is appropriate and necessary to regulate coal- and oil-fired EGUs under CAA section 112. See 87 FR 7624 (February 9, 2022). Section IV of this preamble describes some of the most pertinent public comments received on the 2022 Proposal and provides the EPA's responses. (All of the comments are addressed in the EPA's 2023 Response to Comments (RTC) Document.[5]) This section follows the same order as the preceding section with individual sections for comment responses for health hazards (IV.A), costs (IV.B), revocation (IV.C), the preferred approach (*i.e.,* totality of the circumstances) (IV.D), and the alternative approach (*i.e.,* formal BCA) (IV.E).

Finally, section V of this document notes that because this action reaffirms prior determinations and does not impact implementation of MATS, the action does not result in any cost, environmental, or economic impacts.[6]

B. Does this action apply to me?

The source category that is the subject of this action is coal- and oil-fired EGUs regulated by NESHAP under 40 CFR part 63, subpart UUUUU, commonly known as MATS. The North American Industry Classification System (NAICS) codes for the coal- and oil-fired EGU source category are 221112, 221122, and 921150. This list of NAICS codes is not intended to be exhaustive, but rather provides a guide for readers regarding the entities that this action is likely to affect.

C. Where can I get a copy of this document and other related information?

In addition to being available in the docket, an electronic copy of this action is available on the internet. Following signature by the EPA Administrator, the EPA will post a copy of this action at *https://www.epa.gov/stationary-sources-air-pollution/mercury-and-air-toxics-standards.* Following publication in the **Federal Register**, the EPA will post the **Federal Register** version of the final action and key technical documents at this same website.

D. Judicial Review and Administrative Reconsideration

Under CAA section 307(b)(1), judicial review of this final action is available only by filing a petition for review in the United States Court of Appeals for the District of Columbia Circuit by May 5, 2023. Under CAA section 307(b)(2), the requirements established by this final action may not be challenged separately in any civil or criminal proceedings brought by the EPA to enforce the requirements.

Section 307(d)(7)(B) of the CAA further provides that only an objection to a rule or procedure which was raised with reasonable specificity during the period for public comment (including any public hearing) may be raised during judicial review. That section of the CAA also provides a mechanism for the EPA to reconsider the rule if the person raising an objection can demonstrate to the Administrator that it was impracticable to raise such objection within the period for public comment or if the grounds for such objection arose after the period for public comment (but within the time specified for judicial review) and if such objection is of central relevance to the outcome of the rule. Any person seeking to make such a demonstration should submit a Petition for Reconsideration to the Office of the Administrator, U.S. EPA, Room 3000, WJC South Building, 1200 Pennsylvania Ave. NW, Washington, DC 20460, with a copy to both the person(s) listed in the preceding **FOR FURTHER INFORMATION CONTACT** section, and the Associate General Counsel for the Air and Radiation Law Office, Office of General Counsel (Mail Code 2344A), U.S. EPA, 1200 Pennsylvania Ave. NW, Washington, DC 20460.

II. Background

A. Regulatory History

In the 1990 Amendments, Congress substantially modified CAA section 112 to address HAP emissions from stationary sources. CAA section 112(b)(1) sets forth a list of 187 identified HAP, and CAA sections 112(b)(2) and (3) give the EPA the authority to add or remove pollutants from the list. CAA section 112(a)(1) and (2) specify the two types of sources to be addressed: major sources and area sources. A major source is any stationary source or group of stationary sources at a single location and under common control that emits or has the potential to emit, considering controls, 10 tons per year (tpy) or more of any HAP or 25 tpy or more of any combination of HAP. CAA section 112(a)(1). Any stationary source of HAP that is not a major source is an area source.[7] CAA section 112(a)(2). All major source categories, besides EGUs, and certain area source categories, were required to be included on an initial published list of sources subject to regulation under CAA section 112. See CAA sections 112(a)(1) and (c)(1). The EPA is required to promulgate emission standards under CAA section 112(d) for

[5] *Mercury and Air Toxics Standards for Power Plants 2022 Proposed Revocation of the 2020 Reconsideration and Affirmation of the Appropriate and Necessary Supplemental Finding. Response to Comments.* Available in the rulemaking docket, Docket ID No. EPA–HQ–OAR–2018–0794.

[6] However, finalizing this affirmative threshold determination provides important certainty about the future of MATS for regulated industry, states, other stakeholders, and the public.

[7] The statute includes a separate definition of ''EGU'' that includes both major and area source power plant facilities. CAA section 112(a)(8).

every source category on the CAA section 112(c)(1) list.

The general CAA section 112(c) process for listing source categories does not apply to EGUs. Instead, Congress enacted a special provision, CAA section 112(n)(1)(A), which establishes a separate process by which the EPA determines whether to add EGUs to the CAA section 112(c) list of source categories that must be regulated under CAA section 112. Because EGUs were subject to other CAA requirements under the 1990 Amendments, most importantly the Acid Rain Program (ARP), CAA section 112(n)(1)(A) directs the EPA to conduct a study to evaluate the hazards to public health that are reasonably anticipated to occur as a result of the HAP emissions from EGUs ''after imposition of the requirements of this chapter.'' See CAA section 112(n)(1)(A); see also *Michigan* v. *EPA,* 576 U.S. at 748 (''Quite apart from the hazardous-air-pollutants program, the Clean Air Act Amendments of 1990 subjected power plants to various regulatory requirements. The parties agree that these requirements were expected to have the collateral effect of reducing power plants' emissions of hazardous air pollutants, although the extent of the reduction was unclear.''). The provision directs that the EPA shall regulate EGUs under CAA section 112 if the Administrator determines, after considering the results of the study, that such regulation is ''appropriate and necessary.'' CAA section 112(n)(1)(A), as enacted in 1990, therefore sets a unique process by which the Administrator was to make a one-time determination whether to add EGUs to the CAA section 112(c) list of sources that must be subject to regulation under CAA section 112.

The study required under CAA section 112(n)(1)(A) is one of three studies commissioned by Congress under CAA section 112(n)(1), a subsection entitled ''Electric utility steam generating units.'' The first, which, as noted, the EPA was required to consider before making the appropriate and necessary determination, was completed in 1998 and was entitled ''Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units–Final Report to Congress'' (Utility Study).[8] The Utility Study contained an analysis of HAP emissions from EGUs, an assessment of the hazards and risks due to inhalation exposures to these emitted pollutants, and a multipathway (inhalation plus non-inhalation exposures) risk assessment for mercury and a subset of other relevant HAP. The study indicated that mercury was the HAP of greatest concern to public health from coal- and oil-fired EGUs. The study also concluded that numerous control strategies were available to reduce HAP emissions from this source category.

The second study commissioned by Congress under CAA section 112(n)(1)(B), the ''Mercury Study Report to Congress'' (Mercury Study),[9] was released in 1997. Under this provision, the statute tasked the EPA with focusing exclusively on mercury, but directed the EPA to look at other stationary sources in addition to EGUs, the rate and mass of emissions coming from those sources, available technologies for controlling mercury and the costs of such technologies, and a broader scope of impacts including environmental effects. As in the Utility Study, the EPA confirmed that mercury is highly toxic, persistent, and bioaccumulates in food chains. Fish consumption is the primary pathway for human exposure to mercury, which can lead to higher risks in certain populations. The third study, required under CAA section 112(n)(1)(C), directed the National Institute of Environmental Health Sciences (NIEHS) to conduct a study to determine the threshold level of mercury exposure below which adverse human health effects were not expected to occur (NIEHS Study). The statute required that the study include a threshold for mercury concentrations in the tissue of fish that could be consumed, even by sensitive populations, without adverse effects to public health. The NIEHS submitted the required study to Congress in 1995.[10] See 76 FR 24982 (May 3, 2011).

Later, after submission of the CAA section 112(n)(1) reports and as part of the fiscal year 1999 appropriations, Congress further directed the EPA to fund the National Academy of Sciences (NAS) to perform an independent evaluation of the data related to the health impacts of methylmercury, and, similar to the CAA section 112(n)(1)(C) inquiry, specifically to advise the EPA as to the appropriate reference dose (RfD) for methylmercury. Congress also indicated in the 1999 conference report directing the EPA to fund the NAS Study, that the EPA should not make the appropriate and necessary regulatory determination until the EPA had reviewed the results of the NAS Study. See H.R. Conf. Rep. No. 105–769, at 281–282 (1998). This last study, completed by the NAS in 2000, was entitled ''Toxicological Effects of Methylmercury'' (NAS Study),[11] and it presented a rigorous peer-review of the EPA's RfD for methylmercury.

Based on the results of these studies and other available information, the EPA determined on December 20, 2000, pursuant to CAA section 112(n)(1)(A), that it is appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs and added such units to the CAA section 112(c) list of source categories that must be regulated under CAA section 112. See 65 FR 79825 (December 20, 2000) (2000 Determination).[12]

In 2005, the EPA revised the original 2000 Determination and concluded that it was neither appropriate nor necessary to regulate EGUs under CAA section 112 in part because the EPA concluded it could address risks from EGU HAP emissions under a different provision of the statute. See 70 FR 15994 (March 29, 2005) (2005 Revision). Based on that determination, the EPA removed coal- and oil-fired EGUs from the CAA section 112(c) list of source categories to be regulated under CAA section 112. In a separate but related 2005 action, the EPA also promulgated the Clean Air Mercury Rule (CAMR), which established CAA section 111 standards of performance for mercury emissions from EGUs. See 70 FR 28605 (May 18, 2005). Both the 2005 Revision and the CAMR were vacated by the U.S. Court of Appeals for the District of Columbia Circuit (the court) in 2008. *New Jersey* v. *EPA,* 517 F.3d 574 (D.C. Cir. 2008). The court held that the EPA failed to comply with the requirements of CAA section 112(c)(9) for delisting source categories, and consequently also vacated the CAA section 111 performance standards promulgated in CAMR, without addressing the merits of those standards. *Id.* at 582–84.

Subsequent to the *New Jersey* decision, the EPA conducted additional technical analyses, including peer-reviewed risk assessments on human

[8] U.S. EPA. *Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units—Final Report to Congress.* EPA–453/R–98–004a. February 1998.

[9] U.S. EPA. 1997. *Mercury Study Report to Congress.* EPA–452/R–97–003 December 1997.

[10] National Institute of Environmental Health Sciences (NIEHS) Report on Mercury; available in the rulemaking docket at EPA–HQ–OAR–2009–0234–3053.

[11] National Research Council (NAS). 2000. *Toxicological Effects of Methylmercury.* Committee on the Toxicological Effects of Methylmercury, Board on Environmental Studies and Toxicology, National Research Council. Many of the peer-reviewed articles cited in this section are publications originally cited in the NAS report.

[12] In the same 2000 action, the EPA Administrator found that regulation of HAP emissions from natural gas-fired EGUs is not appropriate or necessary because the impacts due to HAP emissions from such units are negligible. See 65 FR 79831 (December 20, 2000).

health effects associated with mercury (2011 Final Mercury TSD) [13] and non-mercury metal HAP emissions from EGUs (2011 Non-Hg HAP Assessment).[14] Those analyses, which focused on populations with higher fish consumption (*e.g.,* subsistence fishers) and residents living near the facilities who experienced increased exposure to HAP through inhalation, found that mercury and non-mercury HAP emissions from EGUs remain a public health hazard and that EGUs were the largest anthropogenic source of mercury emissions to the atmosphere in the U.S. Based on these findings, and other relevant information regarding the volume of HAP, environmental effects, and availability of controls, in 2012, the EPA affirmed the original 2000 Determination that it is appropriate and necessary to regulate EGUs under CAA section 112. See 77 FR 9304 (February 16, 2012).

In the same 2012 action, the EPA established a NESHAP, commonly referred to as MATS, that required coal- and oil-fired EGUs to meet HAP emission standards reflecting the application of the maximum achievable control technology (MACT) for all HAP emissions from EGUs.[15] MATS applies to existing and new coal- and oil-fired EGUs located at both major and area sources of HAP emissions. An EGU is a fossil fuel-fired steam generating combustion unit of more than 25 megawatts (MW) that serves a generator that produces electricity for sale. See CAA section 112(a)(8) (defining EGU). A unit that cogenerates steam and electricity and supplies more than one-third of its potential electric output capacity and more than 25 MW electric output to any utility power distribution system for sale is also an EGU. *Id.*

For coal-fired EGUs, MATS includes standards to limit emissions of mercury, acid gas HAP, non-mercury HAP metals (*e.g.,* nickel, lead, chromium), and organic HAP (*e.g.,* formaldehyde, dioxin/furan). Standards for hydrogen chloride (HCl) serve as a surrogate for the acid gas HAP, with an alternate standard for sulfur dioxide (SO_2) that may be used as a surrogate for acid gas HAP for those coal-fired EGUs with flue gas desulfurization (FGD) systems and SO_2 continuous emissions monitoring systems that are installed and operational. Standards for filterable PM serve as a surrogate for the non-mercury HAP metals, with standards for total non-mercury HAP metals and individual non-mercury HAP metals provided as alternative equivalent standards. Work practice standards that require periodic combustion process tune-ups were established to limit formation and emissions of the organic HAP.

For oil-fired EGUs, MATS includes standards to limit emissions of HCl and hydrogen fluoride (HF), total HAP metals (*e.g.,* mercury, nickel, lead), and organic HAP (*e.g.,* formaldehyde, dioxin/furan). Standards for filterable PM serve as a surrogate for total HAP metals, with standards for total HAP metals and individual HAP metals provided as alternative equivalent standards. Periodic combustion process tune-up work practice standards were established to limit formation and emissions of the organic HAP.

Additional detail regarding the types of units regulated under MATS and the regulatory requirements that they are subject to can be found in 40 CFR part 63, subpart UUUUU.[16] The existing source compliance date was April 16, 2015, but many existing sources were granted an additional 1-year extension of the compliance date for the installation of controls. Currently all affected sources (*i.e.,* all coal- and oil-fired EGUs that meet the definition of an Electric Utility Steam Generating Unit in CAA section 112(a)(8)) are subject to the requirements in MATS.

After MATS was promulgated, both the rule itself and many aspects of the EPA's appropriate and necessary determination were challenged in the D.C. Circuit court (the court). In *White Stallion Energy Center* v. *EPA,* 748 F.3d 1222 (2014), the court unanimously denied all challenges to MATS, with one exception discussed below in which the court denied the challenge in an opinion that was not unanimous. As part of its decision, the court concluded that the ''EPA's 'appropriate and necessary' determination in 2000, and the reaffirmation of that determination in 2012, are amply supported by EPA's findings regarding the health effects of mercury exposure.'' *Id.* at 1245.[17] While joining the majority's conclusions as to the adequacy of the EPA's identification of public health hazards, then-judge Kavanaugh dissented on the issue of whether the EPA erred by not considering costs together with the harms of HAP emissions when making the ''appropriate and necessary'' determination, finding that cost was a required consideration under that determination. *Id.* at 1258–59 (Kavanaugh, J., dissenting).

The U.S. Supreme Court (the Court) subsequently granted *certiorari,* directing the parties to address a single question posed by the Court itself: ''Whether the Environmental Protection Agency unreasonably refused to consider cost in determining whether it is appropriate to regulate hazardous air pollutants emitted by electric utilities.'' *Michigan* v. *EPA,* 135 S. Ct. 702 (Mem.) (2014). In 2015, the Court held that ''EPA interpreted [CAA section 112(n)(1)(A)] unreasonably when it deemed cost irrelevant to the decision to regulate power plants.'' *Michigan,* 576 U.S. at 760. In so holding, the Court found that the EPA ''must consider cost—including, most importantly, cost of compliance—before deciding whether regulation is appropriate and necessary.'' *Id.* at 2711. It is ''up to the Agency,'' the Court added, ''to decide (as always, within the limits of reasonable interpretation) how to account for cost.'' *Id.* The rule was ultimately remanded back to the EPA to complete the required cost analysis, and the court left the MATS rule in place pending the completion of that analysis. *White Stallion Energy Center* v. *EPA,* No. 12–1100, ECF No. 1588459 (D.C. Cir. December 15, 2015).

[13] U.S. EPA. 2011. *Revised Technical Support Document: National-Scale Assessment of Mercury Risk to Populations with High Consumption of Self-caught Freshwater Fish in Support of the Appropriate and Necessary Finding for Coal- and Oil-Fired Electric Generating Units.* Office of Air Quality Planning and Standards. December 2011. EPA–452/R–11–009. Docket ID Item No. EPA–HQ–OAR–2009–0234–19913 (2011 Final Mercury TSD).

[14] U.S. EPA. 2011. *Supplement to the Non-Hg Case Study Chronic Inhalation Risk Assessment In Support of the Appropriate and Necessary Finding for Coal- and Oil-Fired Electric Generating Units.* Office of Air Quality Planning and Standards. November 2011. EPA–452/R–11–013. Docket ID Item No. EPA–HQ–OAR–2009–0234–19912 (2011 Non-Hg HAP Assessment).

[15] Although the 2012 MATS Final Rule has been amended several times, the amendments are not a result of actions regarding the appropriate and necessary determination and, therefore, are not discussed in this preamble. Detail regarding those amendatory actions can be found at *https://www.epa.gov/stationary-sources-air-pollution/mercury-and-air-toxics-standards.*

[16] Available at *https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-63/subpart-UUUUU.*

[17] In discussing the 2011 Final Mercury TSD, the D.C. Circuit concluded that the EPA considered the available scientific information in a rational manner, and stated:

As explained in the technical support document (TSD) accompanying the Final Rule, EPA determined that mercury emissions posed a significant threat to public health based on an analysis of women of child-bearing age who consumed large amounts of freshwater fish. See [2011 Final] Mercury TSD . . . . The design of EPA's TSD was neither arbitrary nor capricious; the study was reviewed by EPA's independent Science Advisory Board, stated that it ''support[ed] the overall design of and approach to the risk assessment'' and found ''that it should provide an objective, reasonable, and credible determination of potential for a public health hazard from mercury emissions emitted from U.S. EGUs.'' . . . In addition, EPA revised the final TSD to address SAB's remaining concerns regarding EPA's data collection practices.

Id. at 1245–46.

In response to the Court's direction, the EPA finalized a supplemental finding on April 25, 2016, that evaluated the costs of complying with MATS and concluded that the appropriate and necessary determination was still valid. The 2016 Supplemental Finding promulgated two different approaches to incorporate cost into the decision-making process for the appropriate and necessary determination. See 81 FR 24420 (April 25, 2016). The EPA determined that both approaches independently supported the conclusion that regulation of HAP emissions from EGUs is appropriate and necessary.

The EPA's preferred approach to incorporating cost in 2016 evaluated estimated costs of compliance with MATS against several cost metrics relevant to the EGU sector (*e.g.,* historical annual revenues, annual capital expenditures, and impacts on retail electricity prices) and found that the projected costs of MATS were reasonable for the sector in comparison with historical data on those metrics. These metrics are relevant measures for evaluating costs to the utility sector in part because they are the types of metrics considered by the owners and operators of EGUs themselves.[18] The evaluation of cost metrics that the EPA applied was consistent with approaches commonly used to evaluate environmental policy cost impacts.[19] The EPA also examined as part of its cost analysis what the impact of MATS would be on retail electricity prices and the reliability of the power grid. The EPA then weighed these supplemental findings regarding cost against the existing administrative record detailing the identified hazards to public health and the environment from mercury, non-mercury metal HAP, and acid gas HAP that are listed under CAA section 112, and the other advantages to regulation. Based on that balancing, the EPA concluded under the preferred approach that it remained appropriate to regulate HAP emissions from EGUs after considering cost. See 81 FR 24420 (April 25, 2016) (''After evaluating cost reasonableness using several different metrics, the Administrator has, in accordance with her statutory duty under CAA section 112(n)(1)(A), weighed cost against the previously identified advantages of regulating HAP emissions from EGUs—including the agency's prior conclusions about the significant hazards to public health and the environment associated with such emissions and the volume of HAP that would be reduced by regulation of EGUs under CAA section 112.'').

In a second alternative and independent approach (referred to as the alternative approach), in 2016 the EPA considered a formal BCA and applied the formal BCA that was available in the 2011 RIA for the 2012 MATS Final Rule. *Id.* at 24421. In that analysis, even though the EPA was only able to monetize one HAP-specific endpoint, the EPA estimated that in 2015 the final MATS rule would yield annual monetized net benefits (in 2007 dollars) of between $37 billion to $90 billion using a 3-percent discount rate and between $33 billion to $81 billion using a 7-percent discount rate, in comparison to the projected $9.6 billion in annual compliance costs. The vast majority of these monetized social benefits were the result of non-HAP emission reductions due to the MATS requirements. See *id.* at 24425. The EPA therefore determined that the alternative approach also independently supported the conclusion that regulation of HAP emissions from EGUs remains appropriate after considering cost. *Id.*

Several state and industry groups petitioned for review of the 2016 Supplemental Finding in the D.C. Circuit. *Murray Energy Corp.* v. *EPA,* No. 16–1127 (D.C. Cir. filed April 25, 2016). In April 2017, the EPA moved the court to continue oral argument and hold the case in abeyance in order to give the then-new Administration an opportunity to review the 2016 action, and the court ordered that the consolidated challenges to the 2016 Supplemental Finding be held in abeyance (*i.e.,* temporarily on hold).[20]

Accordingly, the EPA reviewed the 2016 action, and on May 22, 2020, finalized a revised response to the *Michigan* decision. See 85 FR 31286 (May 22, 2020). In the 2020 Final Action, after primarily comparing the projected costs of compliance to the single HAP emission reduction impact that could be monetized, the EPA reconsidered its previous determination and found that it is not appropriate to regulate HAP emissions from coal- and oil-fired EGUs after a consideration of cost, thereby reversing the EPA's conclusion under CAA section 112(n)(1)(A), first made in 2000 and later affirmed in 2012 and 2016. Specifically, in its reconsideration, the EPA asserted that the 2016 Supplemental Finding considering the cost of MATS was flawed based on its assessment that neither of the two approaches to considering cost in the 2016 Supplemental Finding satisfied the EPA's obligation under CAA section 112(n)(1)(A), as that provision was interpreted by the U.S. Supreme Court in *Michigan.* Additionally, the EPA determined that, while the 2020 Final Action reversed the 2016 Supplemental Finding, it did not remove the coal- and oil-fired EGU source category from the CAA section 112(c)(1) list, nor would it affect the existing CAA section 112(d) emissions standards regulating HAP emissions from coal- and oil-fired EGUs that were promulgated in the 2012 MATS Final Rule.[21] See 85 FR 31312 (May 22, 2020).

In the 2020 Final Action, the EPA also finalized the risk review required by CAA section 112(f)(2) and the first technology review required by CAA section 112(d)(6) for the coal- and oil-fired EGU source category regulated under MATS.[22] The EPA determined that residual risks due to emissions of air toxics from the coal- and oil-fired EGU source category are acceptable and that the current NESHAP provides an ample margin of safety to protect public health and to prevent an adverse environmental effect. In the technology review, the EPA did not identify any new developments in HAP emission controls to achieve further cost-effective emissions reductions. Based on the results of these reviews, the EPA found that no revisions to MATS were warranted. See 85 FR 31314 (May 22, 2020).

[18] 81 FR 24428 (April 25, 2016).

[19] For example, see ''Economic Impact and Small Business Analysis–Mineral Wool and Wool Fiberglass RTRs and Wool Fiberglass Area Source NESHAP'' (U.S. EPA, 2015; *https://www.epa.gov/sites/default/files/2020-07/documents/mwwf_eia_neshap_final_07-2015.pdf*) or ''Economic Impact Analysis of Final Coke Ovens NESHAP'' (U.S. EPA, 2002; *https://www.epa.gov/sites/default/files/2020-07/documents/coke-ovens_eia_neshap_final_08-2002.pdf*).

[20] Order, *Murray Energy Corp.* v. *EPA,* No. 16–1127 (D.C. Cir. April 27, 2017), ECF No. 1672987. In response to a joint motion from the parties to govern future proceedings, the D.C. Circuit issued an order in February 2021 to continue to hold the consolidated cases in *Murray Energy Corp.* v. *EPA* in abeyance. Order, *Murray Energy Corp.* v. *EPA,* No. 16–1127 (D.C. Cir. February 25, 2021), ECF No. 1887125.

[21] This finding was based on *New Jersey* v. *EPA,* 517 F.3d 574 (D.C. Cir. 2008), which held that the EPA is not permitted to remove source categories from the CAA section 112(c)(1) list unless the CAA section 112(c)(9) criteria for delisting have been met.

[22] CAA section 112(f)(2) requires the EPA to conduct a one-time review of the risks remaining after imposition of MACT standards under CAA section 112(d)(2) within 8 years of the effective date of those standards (risk review). CAA section 112(d)(6) requires the EPA to conduct a review of all CAA section 112(d) standards at least every 8 years to determine whether it is necessary to establish more stringent standards after considering, among other things, advances in technology and costs of additional control (technology review). The EPA has always conducted the first technology review at the same time it conducts the risk review and collectively the actions are known at RTRs.

Several states, industry, public health, environmental, and civil rights groups petitioned for review of the 2020 Final Action in the D.C. Circuit. *American Academy of Pediatrics* v. *Regan,* No. 20–1221 and consolidated cases (D.C. Cir. filed June 19, 2020). On September 28, 2020, the court granted the EPA's unopposed motion to sever from the lead case and hold in abeyance two of the petitions for review: *Westmoreland Mining Holdings LLC* v. *EPA,* No. 20–1160 (D.C. Cir. filed May 22, 2020) (challenging the 2020 Final Action as well as prior EPA actions related to MATS, including a challenge to the MATS CAA section 112(d) standards on the basis that the 2020 Final Action's reversal of the appropriate and necessary determination provided a ''grounds arising after'' for filing a petition outside the 60-day window for judicial review of MATS), and *Air Alliance Houston* v. *EPA,* No. 20–1268 (D.C. Cir. filed July 21, 2020) (challenging only the RTR portion of the 2020 Final Action).[23]

On January 20, 2021, the President signed Executive Order 13990, ''Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis.'' The Executive order, among other things, instructs the EPA to review the 2020 Final Action and consider publishing a notice of proposed rulemaking suspending, revising, or rescinding that action. In February 2021, the EPA moved the court to hold *American Academy of Pediatrics* and consolidated cases in abeyance, pending the EPA's review of the 2020 Final Action as prompted in Executive Order 13990, and on February 16, 2021, the D.C. Circuit granted the EPA's motion.[24] On February 9, 2022, the EPA proposed to revoke the 2020 Final Action's determination that it is not appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs under section 112 of the CAA and to reaffirm our earlier determinations—made in 2000 (65 FR 79825; December 20, 2000) (2000 Determination), 2012 (77 FR 9304; February 16, 2012) (2012 MATS Final Rule), and 2016—that it is appropriate and necessary to regulate coal- and oil-fired EGUs under section 112 of the CAA.

In the meantime, the requirements of MATS have been fully implemented, resulting in significant reductions in HAP emissions from EGUs and the risks associated with those emissions. When the final rule was promulgated, the EPA projected that annual EGU mercury emissions would be reduced by 75 percent with MATS implementation. In fact, considering MATS and other market conditions, EGU mercury emission reductions have been far more substantial and have decreased to approximately 4 tons in 2017, which represents an 86 percent reduction compared to 2010 (pre-MATS) levels. See Table 4 at 84 FR 2689 (February 7, 2019). Acid gas HAP and non-mercury metal HAP emissions have similarly been reduced—by 96 percent and 81 percent, respectively—as compared to 2010 levels. *Id.* MATS is the only Federal requirement that requires HAP control from EGUs.

After considering public comment on the 2022 Proposal, the EPA is finalizing a revocation of the 2020 reconsideration of the 2016 Supplemental Finding and reaffirming once again that it is appropriate and necessary to regulate emissions of HAP from coal- and oil-fired EGUs. We will provide notice of the results of our review of the 2020 RTR in a separate future action.

B. Statutory Background

Additional statutory context is useful to help identify the relevant factors that the Administrator should weigh when making the appropriate and necessary determination.

1. Pre-1990 History of HAP Regulation

In 1970, Congress enacted CAA section 112 to address the millions of pounds of HAP emissions that were estimated to be emitted from stationary sources in the country. At that time, the CAA defined HAP as ''an air pollutant to which no ambient air quality standard is applicable and which, in the judgment of the Administrator may cause, or contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness,'' but the statute left it to the EPA to identify and list pollutants that were HAP. Once a HAP was listed, the statute required the EPA to regulate sources of that identified HAP ''at the level which in [the Administrator's] judgment provides an ample margin of safety to protect the public health from such hazardous air pollutants.'' CAA section 112(b)(1)(B) (pre-1990 amendments); Legislative History of the CAA Amendments of 1990 (''Legislative History''), at 3174–75, 3346 (Comm. Print 1993). The statute did not define the term ''ample margin of safety'' or provide a risk metric on which the EPA was to establish standards, and initially the EPA endeavored to account for costs and technological feasibility in every regulatory decision. In *Natural Resources Defense Council (NRDC)* v. *EPA,* 824 F.2d 1146 (D.C. Cir. 1987), the court concluded that the CAA required that in interpreting what constitutes ''safe,'' the EPA was prohibited from considering cost and technological feasibility. *Id.* at 1166.

The EPA subsequently issued the NESHAP for benzene in accordance with the *NRDC* holding.[25] Among other things, the Benzene NESHAP concluded that there is a rebuttable presumption that any cancer risk greater than 100-in-1 million to the most exposed individual is unacceptable, and per *NRDC,* must be addressed without consideration of cost or technological feasibility. The Benzene NESHAP further provided that, after evaluating the acceptability of cancer risks, the EPA must evaluate whether the current level of control provides an ample margin of safety for any risk greater than 1-in-1 million and, if not, the EPA will establish more stringent standards as necessary after considering cost and technological feasibility.[26]

2. Clean Air Act 1990 Amendments to Section 112

As the following discussion demonstrates, throughout CAA section 112 and its legislative history, Congress made clear its intent to quickly secure large reductions in the volume of HAP emissions from stationary sources because of its recognition of the hazards to public health and the environment that result from exposure to such emissions. CAA section 112 and its legislative history also reveal Congress' understanding that fully characterizing the risks posed by HAP emissions was exceedingly difficult; thus, Congress purposefully replaced a regime that required the EPA to make an assessment of risk in the first instance, with one in which Congress determined risk existed and directed the EPA to make swift and substantial reductions based upon the

[23] Order, *Westmoreland Mining Holdings LLC* v. *EPA,* No. 20–1160 (D.C. Cir. September 28, 2020), ECF No. 1863712.

[24] Order, *American Academy of Pediatrics* v. *Regan,* No. 20–1221 (D.C. Cir. February 16, 2021), ECF No. 1885509.

[25] National Emissions Standards for Hazardous Air Pollutants: Benzene Emissions from Maleic Anhydride Plants, Ethylbenzene/Styrene Plants, Benzene Storage Vessels, Benzene Equipment Leaks, and Coke By-Product Recovery Plants (Benzene NESHAP). 54 FR 38044 (September 14, 1989).

[26] ''In protecting public health with an ample margin of safety under section 112, EPA strives to provide maximum feasible protection against risks to health from hazardous air pollutants by (1) protecting the greatest number of persons possible to an individual lifetime risk level no higher than approximately 1 in 1 million and (2) limiting to no higher than approximately 1 in 10 thousand the estimated risk that a person living near a plant would have if he or she were exposed to the maximum pollutant concentrations for 70 years.'' Benzene NESHAP, 54 FR 38044–5, September 14, 1989.

most stringent standards technology could achieve. The statutory design and direction also repeatedly emphasize that the EPA should regulate with the most exposed and most sensitive members of the population in mind in order to achieve an acceptable level of HAP emissions with an ample margin of safety. As explained further below, this statutory context informs the EPA's judgment as to the relevant factors to weigh in the analysis of whether regulation remains appropriate along with a consideration of cost.

In 1990, Congress radically transformed section 112 of the CAA and its treatment of hazardous air pollution. The legislative history of the amendments indicates Congress' dissatisfaction with the EPA's slow pace addressing these pollutants under the 1970 CAA: ''In theory, [hazardous air pollutants] were to be stringently controlled under the existing Clean Air Act section 112. However, . . . only 7 of the hundreds of potentially hazardous air pollutants have been regulated by EPA since section 112 was enacted in 1970.'' H.R. Rep. No. 101–490, at 315 (1990); see also *id.* at 151 (noting that in 20 years, the EPA's establishment of standards for only seven HAP covered ''a small fraction of the many substances associated . . . with cancer, birth defects, neurological damage, or other serious health impacts.''). Congress was concerned with how few sources had been addressed during this time. *Id.* (''[The EPA's] regulations sometimes apply only to limited sources of the relevant pollutant. For example, the original benzene standard covered just one category of sources (equipment leaks). Of the 50 toxic substances emitted by industry in the greatest volume in 1987, only one—benzene—has been regulated even partially by EPA.''). Congress noted that state and local regulatory efforts to act in the face of ''the absence of Federal regulations'' had ''produced a patchwork of differing standards,'' and that ''[m]ost states . . . limit the scope of their program by addressing a limited number of existing sources or source categories, or by addressing existing sources only on a case-by-case basis as problem sources are identified'' and that ''[o]ne state exempts all existing sources from review.'' *Id.*

In enacting the 1990 Amendments with respect to the control of hazardous air pollution, Congress noted that ''[p]ollutants controlled under [section 112] tend to be less widespread than those regulated [under other sections of the CAA], but are often associated with more serious health impacts, such as cancer, neurological disorders, and reproductive dysfunctions.'' *Id.* at 315. In its substantial 1990 Amendments, Congress itself listed 189 HAP (CAA section 112(b)) and set forth a statutory structure that would ensure swift regulation of a significant majority of these HAP emissions from stationary sources. Specifically, after defining major and area sources and requiring the EPA to list all major sources and many area sources of the listed pollutants (CAA section 112(c)), the new CAA section 112 required the EPA to establish technology-based emission standards for listed source categories on a prompt schedule and to revisit those technology-based standards every 8 years (CAA section 112(d) (emission standards); CAA section 112(e) (schedule for standards and review)). The 1990 Amendments also obligated the EPA to evaluate the residual risk within 8 years of promulgation of technology-based standards. CAA section 112(f)(2).

In setting the standards, CAA section 112(d) requires the EPA to establish technology-based standards that achieve the ''maximum degree of reduction,'' ''including a prohibition on such emissions where achievable.'' CAA section 112(d)(2). Congress specified that the maximum degree of reduction must be at least as stringent as the average level of control achieved in practice by the best performing sources in the category or subcategory based on emissions data available to the EPA at the time of promulgation. This technology-based approach permitted the EPA to swiftly set standards for source categories without determining the risk or cost in each specific case, as the EPA had done prior to the 1990 Amendments. In other words, this approach to regulation quickly required that all major sources and many area sources of HAP install control technologies consistent with the top performers in each category, which had the effect of obtaining immediate reductions in the volume of HAP emissions from stationary sources. The statutory requirement that sources obtain levels of emission limitation that have actually been achieved by existing sources, instead of levels that could theoretically be achieved, inherently reflects a built-in cost consideration.[27]

Further, after determining the minimum stringency level of control, or MACT floor, CAA section 112(d)(2) directs the EPA to ''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 EPA determines are achievable after considering the cost of achieving such standards and any non-air-quality health and environmental impacts and energy requirements of additional control. In doing so, the statute further specifies in CAA section 112(d)(2) that the EPA should consider requiring sources to apply measures that, among other things, ''reduce the volume of, or eliminate emissions of, such pollutants . . . '' (CAA section 112(d)(2)(A)), ''enclose systems or processes to eliminate emissions'' (CAA section 112(d)(2)(B)), and ''collect, capture, or treat such pollutants when released . . .'' (CAA section 112(d)(2)(C)). The 1990 Amendments also built in a regular review of new technologies and a one-time review of risks that remain after imposition of MACT standards. CAA section 112(d)(6) requires the EPA to evaluate every NESHAP no less often than every 8 years to determine whether additional control is necessary after taking into consideration ''developments in practices, processes, and control technologies,'' without regard to risk. CAA section 112(f) requires the EPA to ensure within 8 years of promulgating a NESHAP that the risks are acceptable and that the MACT standards provide an ample margin of safety.

The statutory requirement to establish technology-based standards under CAA section 112 eliminated the requirement for the EPA to identify hazards to public health and the environment in order to justify regulation of HAP emissions from stationary sources, reflecting Congress' judgment that such emissions are inherently dangerous. See S. Rep. No. 101–228, at 148 (''The MACT standards are based on the performance of technology, and not on the health and environmental effects of the [HAP].''). The technology review required in CAA section 112(d)(6) further mandates that the EPA continually reassess standards to determine if additional reductions can be obtained, without evaluating the specific risk associated with the HAP

[27] Congress recognized as much:

''The Administrator may take the cost of achieving the maximum emission reduction and any non-air quality health and environmental impacts and energy requirements into account when determining the emissions limitation which is achievable for the sources in the category or subcategory. Cost considerations are reflected in the selection of emissions limitations which have been achieved in practice (rather than those which are merely theoretical) by sources of a similar type or character.''

A Legislative History of the Clean Air Act Amendments of 1990 (CAA Legislative History), Vol 5, pp. 8508 –8509 (CAA Amendments of 1989; p. 168–169; Report of the Committee on Environment and Public Works S. 1630).

emissions that would be reduced. Notably, the CAA section 112(d)(6) review of what additional reductions may be obtained based on new technology is required *even after* the EPA has conducted the one-time CAA section 112(f)(2) review and determined that the existing standard will protect the public with an ample margin of safety.

The statutory structure and legislative history also demonstrate Congress' concern with the many ways that HAP can harm human health and Congress' goal of protecting the most exposed and vulnerable members of society. The committee report accompanying the 1990 Amendments discussed the scientific understanding regarding HAP risk at the time, including the 1989 report on benzene performed by the EPA noted above. H.R. Rep. No. 101–490, at 315. Specifically, Congress highlighted the EPA's findings as to cancer incidence, and importantly, lifetime individual risk to the most exposed individuals. *Id.* The report also notes the limitations of the EPA's assessment: ''The EPA estimates evaluated the risks caused by emissions of a single toxic air pollutant from each plant. But many facilities emit numerous toxic pollutants. The agency's risk assessments did not consider the combined or synergistic effects of exposure to multiple toxics, or the effect of exposure through indirect pathways.'' *Id.* Congress also noted the EPA's use of the maximum exposed individual (MEI) tool to assess risks faced by heavily exposed citizens. *Id.* The report cited particular scientific studies demonstrating that some populations are more affected than others—for example, it pointed out that ''[b]ecause of their small body weight, young children and fetuses are especially vulnerable to exposure to PCB-contaminated fish. One study has found long-term learning disabilities in children who had eaten high-levels of Great Lakes fish.'' *Id.*

The statutory structure confirms Congress' approach to risk and sensitive populations. As noted, the CAA section 112(f)(2) residual risk review requires the EPA—8 years after promulgating the original MACT standard—to consider whether, after imposition of the CAA section 112(d)(2) MACT standard, there are remaining risks from HAP emissions that warrant more stringent standards to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect. See CAA section 112(f)(2)(A). Specifically, the statute requires the EPA to promulgate standards under this risk review provision if the CAA section 112(d) MACT standard does 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.'' *Id.* (emphasis added). Thus, even after the application of MACT standards, the statute directs the EPA to conduct a rulemaking if even *one* person (*i.e.,* ''the individual most exposed to emissions'') has a risk, not a guarantee, of getting cancer. This demonstrates the statutory intent to protect even the most exposed member of the population from the harms attendant to exposure to HAP emissions.

If a residual risk rulemaking is required, as noted above, the statute incorporates the detailed two-step rulemaking approach set forth in the Benzene NESHAP for determining (1) whether HAP emissions from stationary sources pose an unacceptable risk and (2) whether standards provide an ample margin of safety. See CAA section 112(f)(2)(B) (preserving the prior interpretation of ''ample margin of safety'' set forth in the Benzene NESHAP). The first step of this approach includes a rebuttable presumption that any cancer risk greater than 100-in-1 million to the most exposed person is per se unacceptable. For non-cancer chronic and acute risks, the EPA has more discretion to determine what is acceptable, but even then, the statute requires the EPA to evaluate the risks to the most exposed individual and EPA RfDs are developed with the goal of being protective of even sensitive members of the population. See, *e.g.,* CAA section 112(n)(1)(C) (requiring, in part, the development of ''a threshold for mercury concentration in the tissue of fish which may be consumed (including consumption by sensitive populations) without adverse effects to public health''). If risks are found to be unacceptable, the EPA must impose additional control requirements to ensure that post CAA section 112(f) risks from HAP emissions are at an acceptable level, regardless of cost and technological feasibility.

After determining whether the risks are acceptable and developing standards to achieve an acceptable level of risk if necessary, under the second step the EPA must then determine whether more stringent standards are necessary to provide an ample margin of safety to protect public health, and at this stage we must take into consideration cost, technological feasibility, uncertainties, and other relevant factors. As stated in the Benzene NESHAP, ''In protecting public health with an ample margin of safety under section 112, EPA strives to provide maximum feasible protection against risks to health from hazardous air pollutants by . . . protecting the greatest number of persons possible to an individual lifetime risk level no higher than approximately 1-in-1 million.'' See 54 FR 38044–45 (September 14, 1989); see also *NRDC* v. *EPA,* 529 F.3d 1077, 1082 (D.C. Cir. 2008) (finding that ''the Benzene NESHAP standard established a maximum excess risk of 100-in-one million, while adopting the one-in-one million standard as an aspirational goal.'').

The various listing and delisting provisions of CAA section 112 further demonstrate a statutory intent to reduce risk and protect the most exposed members of the population from HAP emissions. Because the listing and delisting provisions focus on ''any'' potential adverse health effects from HAP emissions and ''the individual in the population who is most exposed,'' the EPA must necessarily consider effects to those most exposed to such emissions. See, *e.g.,* CAA section 112(b)(2) (requiring the EPA to add pollutants to the HAP list if the EPA determines the HAP ''presents, or may present'' adverse human health or adverse environmental effects); *id.* at CAA section 112(b)(3)(B) (requiring the EPA to add a pollutant to the list if a petitioner shows that a substance is known to cause or ''may reasonably be anticipated to cause adverse effects to human health or adverse environmental effects''); *id.* at CAA section 112(b)(3) (authorizing the EPA to delete a substance only on a showing that ''the substance may not reasonably be anticipated to cause *any* adverse effects to human health or adverse environmental effects.'') (emphasis added); *id.* at CAA section 112(c)(9)(B)(i) (prohibiting the EPA from delisting a source category if even one source in the category causes a lifetime cancer risk greater than 1-in-1 million to ''the individual in the population who is most exposed to emissions of such pollutants from the source.''); *id.* at CAA section 112(c)(9)(B)(ii) (prohibiting the EPA from delisting a source category unless the EPA determines that the non-cancer causing HAP emitted from the source category do not ''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 of any source'' in the category); see also *id.* at CAA section 112(n)(1)(C) (requiring a study to determine the level of mercury in fish tissue that can be consumed by even ''sensitive populations'' without adverse effect to public health).

The deadlines for action included in the 1990 Amendments indicate that Congress wanted HAP emissions addressed quickly. The statute requires the EPA to list all major source categories within 1 year of the 1990 Amendments and to regulate those listed categories on a strict schedule that prioritizes the source categories that are known or suspected to pose the greatest risks to the public. See CAA sections 112(c)(1), 112(e)(1) and 112(e)(2). For area sources, where the statute provides the EPA with greater discretion to determine the sources to regulate, it also directs the EPA to collect the information necessary to make the listing decision for many area source categories and requires the EPA to act on that information by a date certain.

For example, CAA section 112(k) establishes an area source program designed to identify and list at least 30 HAP that pose the greatest threat to public health in the largest number of urban areas (urban HAP) and to list for regulation area sources that account for at least 90 percent of the area source emissions of the 30 urban HAP. See CAA sections 112(k) and 112(c)(3). In addition to the urban air toxics program, CAA section 112(c)(6) directs the EPA to identify and list sufficient source categories to ensure that at least 90 percent of the aggregate emissions of 7 bioaccumulative and persistent HAP, including mercury, are subject to standards pursuant to CAA sections 112(d)(2) or (d)(4). See CAA section 112(c)(6). Notably, these requirements were *in addition to* any controls on mercury and other CAA section 112(c)(6) HAP that would be imposed if the EPA determined it was appropriate and necessary to regulate EGUs under CAA section 112. This was despite the fact that it was known at the time of enactment that other categories with much lower emissions of mercury would have to be subject to MACT standards because of the exclusion of EGUs from CAA section 112(c)(6).

III. Final Determination Under CAA Section 112(n)(1)(A)

In this final action, the EPA is revoking the 2020 Final Action and concluding, as it did in 2000, 2012, and 2016, that it is appropriate and necessary to regulate HAP emissions from EGUs.[28] We find that, under either our preferred totality-of-the-circumstances framework or our alternative formal BCA framework, the information that was available to the EPA as of the time of the 2012 rulemaking supports a determination that it is appropriate and necessary to regulate HAP from EGUs. We also consider new information regarding the hazards to public health and the environment and the costs of compliance with MATS that has become available since the 2012 rulemaking and find that the updated information strengthens the EPA's conclusion that it is appropriate and necessary to regulate HAP from coal- and oil-fired EGUs.

At the outset, we note that CAA section 112(n)(1)(A) is silent as to whether the EPA may consider updated information when acting on a remand of the appropriate and necessary determination. CAA section 112(n)(1)(A) directs the EPA to conduct the Utility Study within 3 years, and requires the EPA to regulate EGUs if the Administrator makes a finding that it is appropriate and necessary to do so ''after'' considering the results of the Utility Study. Consistent with the EPA's interpretation in 2005, 2012, 2016, and 2020, we do not read this language to *require* the EPA to consider the most-up-to-date information where the EPA is compelled to revisit the determination, but nor do we interpret the provision to *preclude* consideration of new information where reasonable. See 70 FR 16002 (March 29, 2005); 77 FR 9310 (February 16, 2012); 81 FR 24432 (April 25, 2016); 85 FR 31306 (May 22, 2020). As such, in light of CAA section 112(n)(1)(A)'s silence on this question, the EPA has applied its discretion in determining when to consider new information under this provision based on the circumstances. For example, when the EPA was revisiting the determination in 2012, we noted that ''[b]ecause several years had passed since the 2000 finding, the EPA performed additional technical analyses for the proposed rule, even though those analyses were not required.'' 77 FR 9310 (February 16, 2012).[29] Similarly, we think that it is reasonable to consider new information in the context of this action, given that more than a decade has passed since we last considered updated information. In this reconsideration of the determination, consistent with the President's Executive Order, both the growing scientific understanding of public health risks associated with HAP emissions and a clearer picture of the cost of control technologies and the make-up of power sector generation over the last decade may inform the question of whether it is appropriate to regulate, and, in particular, help address the inquiry that the Supreme Court directed us to undertake in *Michigan.* We believe the evolving scientific information with regard to health risks of HAP emissions from EGUs and the advantage of hindsight with regard to costs warrant considering currently available information in making this determination. To the extent that our determination should flow from information that would have been available at the ''initial decision to regulate,'' *Michigan,* 576 U.S. at 754, we conclude that even if we limit ourselves to the prior record the data still support the determination. But we also believe it is reasonable to consider new data, and find that the new information regarding both public health risks and costs bolsters the finding and further supports a determination that it is appropriate and necessary to regulate EGUs for HAP.

In section III.A of this preamble, we describe the advantages of regulation—the reduction in emissions of HAP and attendant reduction in risks to human health and the environment, as well as the distribution of these health benefits. We restate the numerous risks to public health and the environment posed by HAP emissions from EGUs. This includes information previously recognized and documented in the statutorily mandated CAA section 112(n)(1) studies, the 2000 Determination, the 2012 MATS Final Rule, and the 2016 Supplemental Finding about the nature and extent of

[28] This action focuses on an analysis of the ''appropriate'' prong of CAA section 112(n)(1)(A). The *Michigan* decision and subsequent EPA actions addressing that decision have been centered on supplementing the EPA's record with a consideration of the cost of regulation as part of the ''appropriate'' aspect of the overall determination. As noted, the 2020 Final Action, while reversing the 2016 Supplemental Finding as to the EPA's determination that it was ''appropriate'' to regulate HAP from EGUs, did not rescind the EPA's prior determination that it was necessary to regulate. See 84 FR 2674 (February 7, 2019) (''CAA section 112(n)(1)(A) requires the EPA to determine that both the appropriate *and* necessary prongs are met. Therefore, if the EPA finds that either prong is not satisfied, it cannot make an affirmative appropriate and necessary finding. The EPA's reexamination of its determination . . . focuses on the first prong of that analysis.''). The ''necessary'' determination rested on two primary bases: (1) in 2012, the EPA determined that hazards to human health and the environment from HAP emissions from EGUs remained that would not be addressed by other CAA requirements in its future year modeling, which accounted for all CAA requirements to that point; and (2) our conclusion that the only way to ensure permanent reductions in U.S. EGU emissions of HAP and the associated risks to public health and the environment was through standards set under CAA section 112. See 76 FR 25017 (May 23, 2011). We therefore continue our focus in this action on reinstating the ''appropriate'' prong of the determination, leaving undisturbed the EPA's prior conclusions that regulation of HAP from EGUs is ''necessary.'' See 65 FR 79830 (December 20, 2000); 76 FR 25017 (May 3, 2011); 77 FR 9363 (February 16, 2012).

[29] The EPA was not challenged on this interpretation in *White Stallion.*

health and environmental impacts from HAP that are emitted by EGUs, as well as additional risk analyses supported by new scientific studies as summarized in the 2022 Proposal. The additional risk screening analyses introduced in the 2022 Proposal on the connection between mercury and heart disease as well as IQ loss in children across the U.S. further support the conclusion that HAP emissions from EGUs pose hazards to public health and the environment warranting regulating under CAA section 112. This section also notes that these effects are not borne equally across the population and that some historically disadvantaged groups are disproportionally affected by EGU HAP emissions. The EPA also discusses the challenges associated with fully quantifying and monetizing the human health and environmental effects associated with HAP emissions. Finally, although under its preferred approach, the EPA finds regulating EGU HAP emissions is appropriate without consideration of non-HAP emissions reductions, the significant health and environmental benefits from such reductions further support the EPA's conclusion.

We then turn in preamble section III.B. to the disadvantages of regulation—the costs associated with reducing EGU HAP emissions and other potential impacts to the sector and the economy associated with MATS. We first consider the compliance costs. We consider whether the actual compliance costs of MATS are consistent with those projected in the 2011 RIA and conclude that the originally projected costs were likely a significant overestimate. We then evaluate the estimated costs in the 2011 RIA against several metrics relevant to the impacts those costs have on the power sector and on electricity consumers (*e.g.,* historical annual revenues, annual capital and production expenditures, impacts on retail electricity prices, and impacts on resource adequacy and reliability). These analyses, whether based on data available in 2012 or based on updated post-promulgation data, all show that the costs of MATS were within the bounds of typical historical fluctuations and that the industry would be able to comply with MATS and continue to provide a reliable source of electricity without price increases that were outside the range of historical variability.

In section III.C of this preamble, we explain why the methodology used in our 2020 Finding was ill-suited to determining whether EGU HAP regulation is appropriate and necessary. The methodology used in our 2020 Finding gave little weight to the volume of HAP that would be reduced. The methodology also gave little weight to the vast majority of the advantages of reducing EGU HAP, including the reduction of risk to sensitive populations, that are extremely difficult or not currently possible to quantify or monetize.

In preamble section III.D, we explain our preferred totality-of-the-circumstances methodology that we use to make the appropriate determination and our application of that methodology. This approach looks to the statute, and particularly CAA section 112(n)(1)(A) and the other provisions in CAA section 112(n)(1), to help identify the relevant factors to weigh and what weight to afford those factors. Under that methodology we weigh the significant health and environmental advantages of reducing EGU HAP, and in particular the benefits to the most exposed and sensitive individuals, against the disadvantages of using productive resources to achieve those benefits—*i.e.,* the effects on the electric generating industry and its ability to provide reliable and affordable electricity. We ultimately conclude that the advantages outweigh the disadvantages whether we look at the record from 2012 or at our new record, which includes an expanded understanding of the health risks associated with HAP emissions and finds that the MATS compliance costs projected in the 2011 RIA were likely significantly overestimated. While we conclude that regulation is appropriate considering the health and environmental impacts posed by HAP emissions alone, we further consider that, if we also account for the non-HAP benefits in our preferred totality-of-the-circumstances approach, such as the benefits (including reduced mortality) of coincidental reductions in PM, NO_2, SO_2, and ozone concentrations that flow from the application of controls on HAP, the balance weighs even more heavily in favor of regulating HAP emissions from coal- and oil-fired EGUs.

In section III.E, we consider an alternative methodology to make the appropriate determination. This alternative methodology draws upon the formal BCA that was included in the 2011 RIA for the 2012 MATS Final Rule.[30] This formal BCA was conducted in a consistent manner with economic principles and governmental guidance documents for economic analysis (*e.g.,* OMB Circular A–4 and EPA's Guidelines for Preparing Economic Analyses) and summarized monetized costs and benefits in its presentation of net benefits.

The formal BCA approach is not our preferred way to consider advantages and disadvantages for the CAA section 112(n)(1)(A) determination because the EPA's current inability to generate a monetized estimate of the full benefits of HAP reductions can lead to an underestimate of the full monetary value of the net benefits of regulation. As discussed below, the EPA has long acknowledged the extreme difficulty of quantifying and monetizing benefits of many HAP emission reductions, a limitation which hinders a formal BCA designed to capture total social benefits and costs; notably, the 2011 RIA discussed unquantified effects in a qualitative way and noted how these benefits and costs would influence the net benefits. A further limitation of a formal BCA in this context is that they may not always account for important distributional effects, such as impacts to the most exposed and most sensitive individuals in a population, and in this instance did not. To the extent that a formal BCA is appropriate for making the CAA section 112(n)(1)(A) determination, however, the formal BCA approach reported in the 2011 RIA and presented here as alternative methodology demonstrates that—even though many of the benefits of HAP emission reductions currently cannot be fully quantified or monetized—the monetized benefits of MATS still outweigh the monetized costs by a considerable margin, whether we look at the 2012 record or at our updated record. We therefore determine that a formal BCA approach also supports a determination that it is appropriate to regulate EGUs for HAP emissions.

[30] We use the term ''formal benefit-cost analysis'' to refer to an economic analysis that attempts to the extent practicable to quantify all significant consequences of an action in monetary terms in order to determine whether an action increases economic efficiency. Assuming that all consequences can be monetized, actions with positive net benefits (*i.e.,* benefits exceed costs) improve economic efficiency. In other words, it is a determination of whether the willingness to pay for an action by those advantaged by it exceeds the willingness to pay to avoid the action by those disadvantaged by it. Measuring willingness to pay in a common metric of economic value, like dollars, is called monetization, and it allows for such comparisons across individuals. When there are technical limitations that prevent certain benefits or costs that may be of significant magnitude from being quantified or monetized, then information is provided describing those potentially important non-monetized benefits or costs. This usage is consistent with the definition of a BCA used in the economics literature and the EPA's Guidelines for Preparing Economic Analyses. Note that regulatory impact analyses more broadly can give appropriate attention to both unquantified and distributional effects, as OMB's Circular A–4 recommends.

In section III.F, we present the Administrator's conclusion that it remains appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs. In sum, the EPA concludes that it is appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs, whether we are applying the preferred totality-of-the-circumstances methodology or the alternative formal benefit-cost approach as described, and whether we are considering only the administrative record as of the original 2012 MATS Final Rule or based on new information made available since that time. The information and data amassed by the EPA over the decades of administrative analysis and rulemaking devoted to this topic overwhelmingly support the conclusion that the advantages of regulating HAP emissions from coal- and oil-fired EGUs outweigh the disadvantages.

A. Public Health and Environmental Hazards Associated With Emissions From EGUs

1. Overview

The administrative record for the MATS rule detailed several hazards to public health and the environment from HAP emitted by EGUs that remained after imposition of the ARP and other CAA requirements. See 80 FR 75028–29 (December 1, 2015). See also 65 FR 79825–31 (December 20, 2000); 76 FR 24976–25020 (May 3, 2011); 77 FR 9304–66 (February 16, 2012). The EPA considered all of this information again in the 2016 Supplemental Finding, noting that this sector represented a large fraction of U.S. emissions of mercury, non-mercury metal HAP, and acid gases. Specifically, the EPA found that even after imposition of the other requirements of the CAA, but absent MATS, EGUs remained the largest domestic source of mercury, HF, HCl, and selenium emissions and among the largest domestic contributors of arsenic, chromium, cobalt, nickel, hydrogen cyanide, beryllium, and cadmium emissions, and that a significant majority of EGU facilities emitted above the major source thresholds for HAP emissions.

Further, the EPA noted that the risks that accrue from these emissions were significant. These hazards include potential neurodevelopmental impairment, increased cancer risks, and contribution to chronic and acute health disorders, as well as adverse impacts on the environment. Specifically, the EPA pointed to results from its revised nationwide Mercury Risk Assessment (contained in the 2011 Final Mercury TSD) [31] as well as an inhalation risk assessment (2011 Non-Hg HAP Assessment) for non-mercury HAP (*i.e.,* arsenic, nickel, chromium, selenium, cadmium, HCl, HF, hydrogen cyanide, formaldehyde, benzene, acetaldehyde, manganese, and lead). The EPA estimated lifetime cancer risks for inhabitants near some coal- and oil-fired EGUs to exceed 1-in-1 million [32] and noted that this case-study-based estimate likely underestimated the true maximum risks for the EGU source category. See 77 FR 9319 (February 16, 2012). The EPA also found that mercury emissions pose a hazard to wildlife, adversely affecting fish-eating birds and mammals, and that the large volume of acid gas HAP associated with EGUs also pose a hazard to the environment.[33] These technical analyses were all challenged in the *White Stallion* case, and the court found that the EPA's risk finding as to mercury alone—that is, before reaching any other risk finding—established a significant public health concern. The court stated that ''EPA's 'appropriate and necessary' determination in 2000, and its reaffirmation of that determination in 2012, are amply supported by EPA's finding regarding the health effects of mercury exposure.'' *White Stallion Energy Center* v. *EPA,* 748 F.3d 1222, 1245 (D.C. Cir. 2014). Additional scientific evidence about the human health hazards associated with exposure to EGU HAP emissions that has been collected since the 2016 Supplemental Finding and is discussed in this section has extended our confidence that these emissions pose an unacceptable risk to people in the U.S., and in particular, to vulnerable, exposed populations.

The 2022 Proposal reviewed the long-standing and extensive body of evidence and presented new scientific information made available since the 2016 Supplemental Finding, which further demonstrated that HAP emissions from coal- and oil-fired EGUs present hazards to public health and the environment and warranted regulation under CAA section 112. In this section of the preamble, the EPA briefly describes the body of evidence related to the public health burden associated with EGU HAP emissions. The EPA describes the reasons why it is extremely difficult to estimate the full health and environmental impacts associated with exposure to HAP. We note the longstanding challenges associated with quantifying and monetizing these effects, which may be permanent and life-threatening and are often distributed unevenly (*i.e.,* concentrated among highly exposed individuals). Despite these challenges, after assessing all the evidence, the EPA concludes again that regulation of HAP emissions from EGUs under CAA section 112 greatly improves public health by reducing the risks of premature mortality from heart attacks, cancer, and neurodevelopmental delays in children, and by helping to restore economically vital ecosystems used for recreational and commercial purposes. Further, we conclude that these public health improvements will be particularly pronounced for certain segments of the population that are especially vulnerable (*e.g.,* subsistence fishers [34] and their children) to impacts from EGU HAP emissions. In addition, the concomitant reductions in co-emitted pollutants will also provide

[31] U.S. EPA. 2011. *Revised Technical Support Document: National-Scale Assessment of Mercury Risk to Populations with High Consumption of Self-caught Freshwater Fish In Support of the Appropriate and Necessary Finding for Coal- and Oil-Fired Electric Generating Units.* Office of Air Quality Planning and Standards. November. EPA–452/R–11–009. Docket ID Item No. EPA–HQ–OAR–2009–0234–19913.

[32] The EPA determined the 1-in-1 million standard was the correct metric in part because CAA section 112(c)(9)(B)(1) prohibits the EPA from removing a source category from the list if even one person is exposed to a lifetime cancer risk greater than 1-in-1 million, and CAA section 112(f)(2)(A) directs the EPA to conduct a residual risk rulemaking if even one person is exposed to a lifetime excess cancer risk greater than 1-in-1 million. See *White Stallion* at 1235–36 (agreeing it was reasonable for the EPA to consider the 1-in-1 million delisting criteria in defining ''hazard to public health'' under CAA section 112(n)(1)(A)).

[33] The EPA had determined it was reasonable to consider environmental impacts of HAP emissions from EGUs in the appropriate determination because CAA section 112 directs the EPA to consider impacts of HAP emissions on the environment, including in the CAA section 112(n)(1)(B) Mercury Study. See *White Stallion* at 1235–36 (agreeing it was reasonable for the EPA to consider the environmental harms when making the appropriate and necessary determination).

[34] Subsistence fishers, who by definition obtain a substantial portion of their dietary needs from self-caught fish consumption, can experience elevated levels of exposure to chemicals that bioaccumulate in fish including, in particular, methylmercury. Subsistence fishing activity can be related to a number of factors including socio-economic status (poverty) and/or cultural practices, with ethnic minorities and tribal populations often displaying increased levels of self-caught fish consumption (Burger *et al.,* 2002, Shilling *et al.,* 2010, Dellinger 2004).

Burger J, (2002). *Daily consumption of wild fish and game: exposures of high-end recreationalists.* International Journal of Environmental Health Research 12:4, p. 343–354.

Shilling F, White A, Lippert L, Lubell M, (2010). *Contaminated fish consumption in California's Central Valley Delta.* Environmental Research 110, p. 334–344.

Dellinger J, (2004). *Exposure assessment and initial intervention regarding fish consumption of tribal members in the Upper Great Lakes Region in the United States.* Environmental Research 95, p. 325–340.

substantial public health and environmental benefits.

We received numerous public comments on the health hazards associated with EGU HAP emissions, and our detailed responses to these comments are presented in section IV.A below and in the 2023 RTC Document. No information received during the comment period has provided data or methods to cause us to change our approach to the consideration of the advantages of the MATS regulation presented in the 2022 Proposal. As a result, this final action will rely upon the same suite of qualitative and quantitative evidence presented in the 2022 Proposal. While the reader is directed to the 2022 Proposal and the supporting 2021 Risk TSD for the complete analyses, we summarize the analyses in subsequent sections of this preamble.

2. Overview of Health Effects Associated With Mercury and Non-Mercury HAP

In calling for the EPA to consider the regulation of HAP from EGUs, the CAA stipulated that the EPA complete 3 studies (all of which were extensively peer-reviewed) exploring various aspects of risk posed to human health and the environment by HAP released from EGUs. The first of these studies, the Utility Study, published in 1998, focused on the hazards to public health specifically associated with EGU-sourced HAP including, but not limited to, mercury. See CAA section 112(n)(1)(A). A second study, the Mercury Study, released in 1997, while focusing exclusively on mercury, was broader in scope including not only human health, but also environmental impacts, and specifically addressed the potential for mercury released from multiple emissions sources (in addition to EGUs) to affect human health and the environment. See CAA section 112(n)(1)(B). The third study, required under CAA section 112(n)(1)(C), the NIEHS Study, submitted to Congress in 1995, considered the threshold level of mercury exposure below which adverse human health effects were not expected to occur. An additional fourth study, the NAS Study, directed by Congress in 1999 and completed in 2000, focused on determining whether a threshold for mercury health effects could be identified for sensitive populations and, as such, presented a rigorous peer review of the EPA's RfD for methylmercury. The aggregate results of these peer-reviewed studies commissioned by Congress as part of CAA section 112(n)(1) supported the determination that HAP emissions from EGUs represented a hazard to public health and the environment that would not be addressed through imposition of the other requirements of the CAA. In the 2 decades that followed, the EPA has continued to conduct additional research and risk assessments and has surveyed the latest science related to the risk posed to human health and the environment by HAP released from EGUs.

Mercury is a persistent and bioaccumulative toxic metal that, once released from power plants into the ambient air, can be readily transported and deposited to soil and aquatic environments where it is transformed by microbial action into methylmercury. See Mercury Study; 76 FR 24976 (May 3, 2011) (2011 NESHAP Proposal); 80 FR 75029 (December 1, 2015) (2015 Proposal). Methylmercury bioaccumulates in the aquatic food web eventually resulting in highly concentrated levels of methylmercury within the larger and longer-living fish (*e.g.,* carp, catfish, trout, and perch), which can then be consumed by humans (NAS Study). As documented in both the NAS Study and the Mercury Study, fish and seafood consumption is the primary route of human exposure to methylmercury,[35] with populations engaged in subsistence-levels of consumption being of particular concern. The NAS Study reviewed the effects of methylmercury on human health, concluding that it is highly toxic to multiple human and animal organ systems. Of particular concern is chronic prenatal exposure via maternal consumption of foods containing methylmercury. Elevated exposure has been associated with developmental neurotoxicity and manifests as poor performance on neurobehavioral tests, particularly on tests of attention, fine motor function, language, verbal memory, and visual-spatial ability. Evidence also suggests potential for adverse effects on the cardiovascular system, adult nervous system, and immune system, as well as potential for causing cancer.[36] Because the impacts of the neurodevelopmental effects of methylmercury are greatest during periods of rapid brain development, developing fetuses, infants, and young children are particularly vulnerable. Children born to populations with high fish consumption (*e.g.,* people consuming fish as a dietary staple) or impaired nutritional status may be especially susceptible to adverse neurodevelopmental outcomes.[37] These dietary and nutritional risk factors are often particularly pronounced in vulnerable communities with people of color and low-income populations that have historically faced economic and environmental injustice and are overburdened by cumulative levels of pollution.

Infants in the womb can be exposed to methylmercury when their mothers eat fish and shellfish that contain methylmercury. This exposure can adversely affect developing fetuses' growing brains and nervous systems. Based on scientific evidence reflecting concern about a range of neurodevelopmental effects seen in children exposed *in utero* to methylmercury, the EPA defined an RfD of 0.0001 mg/kg-day for methylmercury.[38] [39] An RfD is defined as an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime (EPA, 2002).[40]

In addition to the adverse neurodevelopmental effects, the NAS Study indicated that there was evidence that exposure to methylmercury in humans and animals can have adverse effects on both the developing and adult cardiovascular system. Fetal exposure in the womb to methylmercury has been associated with altered blood-pressure and heart-rate variability in children. In adults, dietary exposure to

[35] In light of the methylmercury impacts, the EPA and the Food and Drug Administration have collaborated to provide advice on eating fish and shellfish as part of a healthy eating pattern (*https://www.fda.gov/food/consumers/advice-about-eating-fish*). In addition, states provide fish consumption advisories designed to protect the public from eating fish from waterbodies within the state that could harm their health based on local fish tissue sampling.

[36] National Research Council. 2000. *Toxicological Effects of Methylmercury.* Washington, DC: The National Academies Press. *https://doi.org/10.17226/9899.*

[37] U.S. EPA. 1997. *Mercury Study Report to Congress.* EPA–452/R–97–003 December 1997.

[38] U.S. EPA. 2001. *IRIS Summary for Methylmercury.* U.S. Environmental Protection Agency, Washington, DC. (USEPA, 2001).

[39] At this time, the EPA is conducting an updated methylmercury IRIS assessment and recently released preliminary assessment materials, an IRIS Assessment Plan (IAP) and Systematic Review Protocol for methylmercury. The update to the methylmercury IRIS assessment will focus on updating the quantitative relationship of neurodevelopmental outcomes with methylmercury exposure. As noted in these preliminary assessment materials, new studies are available, since 2001, assessing the effects of methylmercury exposure on cognitive function, motor function, behavioral, structural, and electrophysiological outcomes at various ages following prenatal or postnatal exposure to methylmercury (USEPA, 2001; NAS Study; 84 FR 13286 (April 4, 2019); 85 FR 32037 (May 8, 2020)).

[40] U.S. EPA. 2002. *A Review of the Reference Dose and Reference Concentration Processes.* EPA/630/P–02/002F, December 2002.

methylmercury has been linked to a higher risk of acute myocardial infarction (MI), coronary heart disease, or cardiovascular heart disease. The Mercury Study noted that while methylmercury is not a potent mutagen, it is capable of causing chromosomal damage in a number of experimental systems. Based on limited human and animal data, methylmercury is classified as a ''possible human carcinogen'' by the International Agency for Research on Cancer (IARC, 1993)[41] and in IRIS (USEPA, 2001). However, a quantitative estimate of the carcinogenic risk of methylmercury has not been assessed under the IRIS program at this time. Multiple human epidemiological studies have found no significant association between methylmercury exposure and overall cancer incidence, although a few studies have shown an association between methylmercury exposure and specific types of cancer incidence (*e.g.,* acute leukemia and liver cancer). Finally, some studies have also indicated reproductive and renal toxicity in humans from methylmercury exposure (NAS Study). However, overall, human data regarding reproductive, renal, and hematological toxicity from methylmercury are very limited and are based on studies of the 2 high-dose poisoning episodes in Iraq and Japan or animal data, rather than epidemiological studies of chronic exposures at the levels of interest in this analysis (*i.e.,* in the range of exposure stemming from U.S. EGU mercury emissions).

Along with the human health hazards associated with methylmercury, it is well-established that birds and mammals are also exposed to methylmercury through fish consumption (Mercury Study). At higher levels of exposure, the harmful effects of methylmercury include slower growth and development, reduced reproduction, and premature mortality. The effects of methylmercury on wildlife are variable across species but have been observed in the environment for numerous avian species and mammals including polar bears, river otters, and panthers.

As noted earlier, EGUs are also the largest source of HCl, HF, and selenium emissions, and are a major source of metallic HAP emissions including arsenic, chromium, nickel, cobalt, and others. Exposure to these HAP, depending on exposure duration and levels of exposures, is associated with a variety of adverse health effects. These adverse health effects may include chronic health disorders (*e.g.,* pneumonitis, decreased pulmonary function, pneumonia, or lung damage; detrimental effects on the central nervous system; damage to the kidneys) and alimentary effects (such as nausea and vomiting). As of 2021, 3 of the key metal HAP emitted by EGUs (arsenic, chromium, and nickel) have been classified as human carcinogens, while 3 others (cadmium, selenium, and lead) are classified as probable human carcinogens. Overall (metal and non-metal), the EPA has classified 4 of the HAP emitted by EGUs as human carcinogens and 5 as probable human carcinogens.

In the 2022 Proposal, the EPA also described 3 new screening-level risk assessments completed since the 2016 Supplemental Finding that further strengthened the conclusion that U.S. EGU-sourced mercury represents a hazard to public health. These screening-level assessments were designed as broad bounding exercises intended to illustrate the potential scope and public health importance of methylmercury risks associated with U.S. EGU emissions. The first assessment focused on neurodevelopmental outcomes and estimated the risk of IQ points loss in children exposed *in utero* through maternal fish consumption by the population of general U.S. fish consumers. The range in IQ points lost annually due to U.S. EGU-sourced mercury was estimated at 1,600 to 6,000 points, which is distributed across the population of U.S. children associated with mothers who consume commercially-sourced fish (*i.e.,* bought in a restaurant or food store) or self-caught fish.[42] The other 2 risk assessments focused on the potential for methylmercury exposure to increase the risk of MI mortality in adults (among subsistence fishers and for the general U.S. population). The new assessment estimated that the MI-mortality attributable to U.S. EGU-sourced mercury for the general U.S. population ranges from 5 to 91 excess deaths each year.[43] For those individuals with high levels of methylmercury in their body (*i.e.,* above certain cutpoints), the science suggests that any additional increase in methylmercury exposure will raise the risk of fatal heart attacks.

3. Most Benefits From HAP Reductions Cannot Currently Be Quantified or Monetized

Despite the array of adverse health and environmental risks associated with HAP emissions from U.S. coal- and oil-fired EGUs documented above, it is technically challenging to quantitatively estimate the extent to which EGU HAP emissions will result in adverse effects across the U.S. population absent regulation. In fact, the vast majority of the benefits of reducing HAP currently cannot be quantified or monetized due to data gaps, as discussed more fully below. But that does not mean that these benefits are small, insignificant, or nonexistent. There are numerous unmonetized effects that contribute to additional benefits realized from emissions reductions. These include additional reductions in neurodevelopmental and cardiovascular effects from exposure to methylmercury, adverse ecosystem effects including mercury-related impacts on recreational and commercial fishing, health risks from exposure to non-mercury HAP, and health risks in environmental justice (EJ) subpopulations that face disproportionally high exposure to EGU HAP.

While the EPA was able to partially quantify IQ loss and fatal MI incidence for methylmercury through bounding analyses in the 2021 Risk TSD, there are additional neurodevelopmental and cardiovascular benefits that lacked the necessary data to quantify their incidence. Another challenge was the lack of data required to quantify the number of people impacted. While it is reasonable to assume that some degree of subsistence fishing activity does occur at methylmercury impacted waterbodies, we were unable to quantify the number of impacted subsistence fishers and their children.

There are several challenges to quantifying HAP benefits. Quantifying HAP benefits requires data to characterize the risk and quantify the magnitude of expected (cancer and non-cancer) health outcomes. Unlike criteria pollutants, for which risk is generally more ubiquitous and there is more available data because a greater number of people are impacted, significant HAP impacts are often localized in

[41] International Agency for Research on Cancer (IARC) Working Group on the Evaluation of Carcinogenic Risks to Humans. *Beryllium, Cadmium, Mercury, and Exposures in the Glass Manufacturing Industry.* Lyon (FR): International Agency for Research on Cancer; 1993. (IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, No. 58.) Mercury and Mercury Compounds. Available from: *https://www.ncbi.nlm.nih.gov/books/NBK499780.*

[42] Inclusion of 95th percentile confidence intervals for the effect estimate used in modeling this endpoint extends this range to from 80 to 12,600 IQ points lost (reflecting the 5th and 95th percentiles).

[43] Inclusion of 95th percentile confidence intervals for the effect estimate used in modeling MI mortality extends this range to from 3 to 143 deaths (reflecting the 5th percentile associated with the 5 lower bound estimate to the 95th percentile for the upper bound estimate of 91).

communities near sources of HAP where the affected population and data can be more limited. Generally, robust data needed to quantify the magnitude of expected adverse noncancer impacts are lacking, and full quantification of these benefits is made even more challenging by the wide array of HAP and possible HAP effects.

Unlike HAP, criteria pollutants are some of the most studied pollutants in the country with nearly the entire U.S. population exposed to such pollutants. This has resulted in significant data for criteria pollutants thanks to an extensive monitoring network to assess exposure within the population. These data support quantitative estimates of risk (incidence) and allow for greater statistical power to identify effects from criteria pollutants with greater precision through hundreds of epidemiological studies which have been conducted over the past 30 years. Furthermore, those observed effect associations have been corroborated through various experimental animal studies and controlled exposure clinical studies. Monetization of those endpoints characterized in epidemiological studies allows for quantification of benefits.

In contrast to criteria pollutants, HAP are not as well studied, which minimizes our ability to quantify risks and monetize benefits. HAP exposures tend to be more localized. Multiple types of HAP may be emitted from a single source, and individual communities can be impacted by multiple sources with varying HAP emissions from each, such that combinations of individual HAP to which people are exposed across communities tend to be highly varied. Additionally, there are a limited number of monitoring sites across the country for HAP, many of which focus on only a small subset of HAP, which limits the ability to assess exposure in epidemiological studies. Given the general lack of sufficient quality epidemiological studies, the EPA tends to rely on experimental animal studies to identify the range of effects which may be associated with a particular HAP exposure.[44] Human controlled clinical studies are often limited due to ethical barriers (*e.g.,* knowingly exposing someone to a carcinogen). As a result, there is insufficient ability to quantify the actual (incidence of) impacts associated with HAP exposures, which is necessary to provide a foundation for benefits.

Without the estimation of specific incidence of effects there is limited ability to monetize benefits from reducing HAP emissions, because doing so requires first quantifying risk. Further, there is a lack of scientific data available to support estimating the economic value of reducing health and environmental impacts that are not otherwise easily valued. While the EPA can quantify mortality resulting from cancer, it is difficult to monetize the value of reducing an individual's potential cancer risk attributable to a lifetime of HAP exposure. An alternative approach of conducting willingness to pay studies specifically on risk reduction may be possible, but such studies have not yet been pursued.

Congress well understood the challenges in quantifying HAP risks. That is why it fundamentally transformed regulation of HAP in the 1990 CAA Amendments to replace a risk-based approach to establishing standards with a technology-based approach. As discussed in section II.B above, the statutory language in CAA section 112 clearly supports a conclusion that the intended benefit of HAP regulation is a reduction in the volume of HAP emissions to reduce risks from HAP with the goal of protecting even the most exposed and most sensitive members of the population. The statute requires the EPA to move aggressively to quickly reduce and eliminate HAP, placing high value on doing so in the face of uncertainty regarding the full extent of harm posed by hazardous pollutants on human health and the environment. The statute also clearly places great value on protecting the most vulnerable members of the population by instructing the EPA, when evaluating risk in the context of a determination of whether regulation is warranted, to focus on risk to the most exposed and most sensitive members of the population. See, *e.g.,* CAA sections 112(c)(9)(B), 112(f)(2)(B), and 112(n)(1)(C). For example, in evaluating the potential for cancer effects associated with emissions from a particular source category under CAA section 112(f)(2), the EPA is directed by Congress to base its determinations on the maximum individual risk to the most highly exposed individual living near a source. Similarly, in calculating the potential for non-cancer effects to occur, the EPA evaluates the impact of HAP to the most exposed individual and accounts for sensitive subpopulations.

Notably, Congress in CAA section 112 did not require the EPA to quantify risk across the entire population, or to calculate average or ''typical'' risks. The statutory design focusing on maximum risk to individuals living near sources acknowledges the difficulty in enumerating HAP effects, given the large number of pollutants and the uncertainties associated with those pollutants, as well as the large number of sources emitting HAP. However, the fact that many effects cannot currently be quantified does not mean that these effects do not exist or that society would not highly value HAP emission reductions. The EPA has long acknowledged the difficulty of quantifying and monetizing HAP benefits. In March 2011, the EPA issued a report on the benefits and costs of the CAA. This Second Prospective Report[45] is the latest in a series of EPA studies that estimate and compare the benefits and costs of the CAA and related programs over time. Notably, it was the first of these reports to include any attempt to quantify and monetize the impacts of reductions in HAP, and it concentrated on a small case study for a single pollutant, entitled ''Air Toxics Case Study—Health Benefits of Benzene Reductions in Houston, 1990–2020.'' As the EPA summarized in the Second Prospective Report, ''[t]he purpose of the case study was to demonstrate a methodology that could be used to generate human health benefits from CAAA controls on a single HAP in an urban setting, while highlighting key limitations and uncertainties in the process. . . . Benzene was selected for the case study due to the availability of human epidemiological studies linking its exposure with adverse health effects'' (pg. 5–29). In describing the approach, the EPA noted: ''[b]oth the Retrospective analysis and the First Prospective analysis omitted a quantitative estimation of the benefits of reduced concentrations of air toxics, citing gaps in the toxicological database, difficulty in designing population-based epidemiological studies with sufficient power to detect health effects, limited ambient and personal exposure monitoring data, limited data to estimate exposures in some critical microenvironments, and insufficient economic research to support valuation of the types of health impacts often associated with exposure to individual air toxics'' (pg. 5–29). These difficulties have long hindered the EPA's ability to quantify the impacts of HAP controls

[44] For many HAP, while available toxicological and epidemiological data allow the estimation of risks, often the types of representative population level epidemiological data needed to estimate incidence in the exposed populations are lacking.

[45] U.S. EPA Office of Air and Radiation, April 2011. *The Benefits and Costs of the Clean Air Act from 1990 to 2020,* Final Report—Rev. A. Available at *https://www.epa.gov/sites/production/files/2015-07/documents/fullreport_rev_a.pdf.*

and estimate the monetary benefits of HAP reductions.

In preparing the benzene case study for inclusion in the Second Prospective Report, the EPA asked the Advisory Council on Clean Air Compliance Analysis (the Council) to review the approach. In its 2008 consensus advice to the EPA after reviewing the benzene case study,[46] the Council noted that ''Benzene . . . has a large epidemiological database which OAR [the EPA's Office of Air and Radiation] used to estimate the health benefits of benzene reductions due to CAAA controls. The Council was asked to consider whether this case study provides a basis for determining the value of such an exercise for HAP benefits characterization nationwide.'' They concluded:

> As recognized by OAR, the challenges for assessing progress in health improvement as a result of reductions in emissions of hazardous air pollutants (HAPs) are daunting. Accordingly, EPA has been unable to adequately assess the economic benefits associated with health improvements from HAP reductions due to a lack of exposure-response functions, uncertainties in emissions inventories and background levels, the difficulty of extrapolating risk estimates to low doses and the challenges of tracking health progress for diseases, such as cancer, that have long latency periods. . . .
>
> The benzene case study successfully synthesized best practices and implemented the standard damage function approach to estimating the benefits of reduced benzene, however the Council is not optimistic that the approach can be repeated on a national scale or extended to many of the other 187 air toxics due to insufficient epidemiological data. With some exceptions, it is not likely that the other 187 HAPs will have the quantitative exposure-response data needed for such analysis. Given EPA's limited resources to evaluate a large number of HAPs individually, the Council urges EPA to consider alternative approaches to estimate the benefits of air toxics regulations.

In addition to the difficulties noted by the Council, there are other challenges that affect the EPA's ability to fully characterize impacts of HAP on populations of concern, including sensitive groups such as children or those who may have underlying conditions that increase their risk of adverse effects following exposure to HAP. Unlike for criteria pollutants such as ozone and PM, the EPA lacks information from controlled human exposure studies conducted in clinical settings which enable us to better characterize dose-response relationships and identify subclinical outcomes. Also, as noted by the Council and by the EPA itself in preparing the benzene case study, the almost universal lack of HAP-focused epidemiological studies is a significant limitation. Estimated risks reported in epidemiologic studies of fine PM ($PM_{2.5}$) and ozone enable the EPA to estimate health impacts across large segments of the U.S. population and quantify the economic value of these impacts. Epidemiologic studies are particularly well suited to informing air pollution health impact assessments because they report measures of population-level risk that can be readily used in a risk assessment.

However, such studies are infrequently performed for HAP. Exposure to HAP is typically more uneven and more highly concentrated among a smaller number of individuals than exposure to criteria pollutants. Hence, conducting an epidemiologic study for HAP is inherently more challenging. A comparatively small number of people are exposed to HAP, which means an epidemiologic study will frequently lack sufficient statistical power to detect an adverse effect. For example, in the case of mercury, the most exposed and most sensitive members of the population may be both small in number and highly concentrated, such as the subsistence fishers that the EPA has identified as most likely to suffer deleterious effects from U.S. EGU HAP emissions. While it is possible to estimate the potential risks confronting this population in a case-study approach (an analysis that plays an important role in supporting the public health hazard determination for mercury as discussed above in sections III.A.2 and III.A.3), it is not possible to translate these risk estimates into quantitative population-level impact estimates for the reasons described above.

Expressing the economic value of avoided HAP-related cases of morbidity effects is also challenging. The EPA lacks willingness-to-pay information that would support estimating the economic value of avoided HAP impacts for outcomes including heart attacks, IQ loss, and renal or reproductive failure. In addition, the absence of socio-demographic data, such as the number of affected individuals comprising sensitive subgroups further limits the ability to monetize HAP-impacted effects. All of these deficiencies impede the EPA's current ability to quantify and monetize HAP-related impacts, even though those impacts may be severe and/or impact significant numbers of people.

Though it may be difficult to quantify and monetize most HAP-related health and environmental benefits, this does not mean such benefits are small. The nature and severity of effects associated with HAP exposure, ranging from lifelong cognitive impairment to cancer to adverse reproductive effects, implies that the economic value of reducing these impacts would be substantial if they could be quantified and monetized completely. By extension, it is reasonable to expect both that reducing HAP-related incidence affecting individual endpoints would yield substantial benefits if fully quantified and monetized, and moreover that the total societal impact of reducing HAP would be quite large when evaluated across the full range of endpoints. In judging it appropriate to regulate based on the risks associated with HAP emissions from U.S. EGUs, the EPA is placing weight on the likelihood that these effects are substantial, as supported by the health evidence. The EPA's new screening-level analyses presented in the 2021 Risk TSD for this action illustrate this point. Specifically, in exploring the potential for MI-related mortality risk attributable to mercury emissions from U.S. EGUs, the EPA's upper bound estimate is that these emissions (*i.e.,* counterfactual EGU emissions in 2016 without MATS) may contribute to as many as 91 additional premature deaths each year. The value society places on avoiding such severe effects is very high; as the EPA illustrates in the valuation discussion in the 2021 Risk TSD, the benefit of avoiding such effects could approach $720 million per year. Similarly, for IQ loss in children exposed *in utero* to U.S. EGU-sourced mercury, our upper bound estimate approaches 6,000 IQ points lost which could translate into a benefit approaching $50 million per year.

These estimates are intended to illustrate the point that the HAP impacts are large and societally meaningful, but not to suggest that they are even close to the full monetized benefits of reducing HAP. There are many other unquantified effects of reducing mercury (*e.g.,* EJ impacts, subsistence fisher impacts, and ecological impacts, among others) and non-mercury HAP (*e.g.,* reduced cancer risks, environmental impacts, and disproportionate exposures) that have substantial value to society. As described above, mercury alone is associated with a host of adverse health and environmental effects. The statute clearly identifies this basket of effects as a significant concern in directing the EPA to study them specifically. If the

[46] U.S. EPA Advisory Council on Clean Air Act Compliance Analysis, Review of the Benzene Air Toxics Health Benefits Case Study. July 11, 2008. Available at *https://nepis.epa.gov/Exe/ZyPDF.cgi/P1000ZYP.PDF?Dockey=P1000ZYP.PDF.*

EPA were able to account for all of these effects in our quantitative estimates, the true benefits of MATS would be far clearer. However, available data and methods currently preclude a full quantitative accounting of the impacts of reducing HAP emissions from U.S. EGUs and a monetization of these impacts.

The HAP-related legislative history for the 1990 Amendments includes little discussion of the monetized benefits of HAP, perhaps due to these attendant difficulties. When such monetized benefits were estimated in several outside reports submitted to Congress before passage of the 1990 Amendments, the estimates were based on reduced cancer deaths and the value of the benefits that are quantified were estimated to be small as compared to the estimated costs of regulating HAP emissions under CAA section 112. See, *e.g., A Legislative History of the Clean Air Act Amendments of 1990,* Vol. I at 1366–67 (November 1993) and *id.* at 1372–73. Despite the apparent disparity between benefits that could be monetized and estimated costs, Congress still enacted the revisions to CAA section 112, requiring regulation of HAP in most instances based on Congress' determination of risk and without first requiring the EPA to assess risk. Thus, it is reasonable to conclude that Congress found HAP emissions to be worth regulating even without evidence that the monetized benefits of doing so were greater than the costs. The EPA believes this stems from the value that the statute places on reducing HAP regardless of whether the benefits of doing so can be quantified or monetized, and the statute's purpose of protecting even the most exposed and most sensitive members of the population.

4. Characterization of HAP Risk Relevant to Consideration of EJ

In assessing the adverse human health effects of HAP emissions from EGUs, we note that these effects are not borne equally across the population, and that some of the most exposed individuals and subpopulations—protection of whom is, as noted, of particular concern under CAA section 112—are people of color and/or low-income populations. The EPA defines EJ as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. See *https://www.epa.gov/environmentaljustice/learn-about-environmental-justice.* The EPA further defines the term fair treatment to mean that no group of people should bear a disproportionate burden of environmental harms and risks, including those resulting from the negative environmental consequences of industrial, governmental, and commercial operations or programs and policies. *Id.*

In the context of MATS, exposure scenarios of clear relevance from an EJ perspective include the full set of subsistence fisher scenarios included in the watershed-level risk assessments completed for the rule. Subsistence fisher populations are potentially exposed to elevated levels of methylmercury due to their elevated levels of self-caught fish consumption which, in turn, are often driven either by economic need (*i.e.,* poverty) and/or cultural practices (*i.e.,* longstanding traditions of fishing and fish consumption are central to many Tribes' cultural identity). In the context of MATS, we completed watershed-level assessments of risks for a broad set of subsistence fisher populations covering 2 health endpoints of clear public health significance including: (a) neurodevelopmental effects in children exposed prenatally to methylmercury (the methylmercury-based RfD analysis described in the 2011 Final Mercury TSD), and (b) potential for increased MI-mortality risk in adults due to methylmercury exposure (see section III.A.3.b in the 2022 Proposal).

The general subsistence fisher population that was evaluated nationally for both analyses was not subdivided by socioeconomic status, race, or cultural practices.[47] Therefore, the risk estimates derived do not fully inform our consideration of EJ impacts, although the significantly elevated risks generated for this general population are clearly relevant from a public health standpoint. However, the other, more differentiated subsistence fisher populations, which are subdivided into smaller targeted communities, are relevant in the EJ context and in some instances were shown to have experienced levels of risk significantly exceeding those of the general subsistence fisher population, as noted in section III.A.3.b in the 2022 Proposal.

In particular, for the watershed analysis focusing on the methylmercury RfD-based analysis (*i.e.,* neurodevelopmental risk for children exposed prenatally), while the general female fisher scenario suggested that modeled exposures (from U.S. EGU-sourced mercury alone) exceeded the methylmercury RfD in approximately 10 percent of the watersheds modeled (2011 Final Mercury TSD, Table 2–6), for low-income Black subsistence fisher females in the Southeast, modeled exposures exceeded the RfD in approximately greater than 25 percent of the watersheds. These results suggest a greater potential for adverse effects in low-income Black populations in the Southeast. Similarly, while the general subsistence fisher had exposure levels suggesting an increased risk for MI-mortality risk in 10 percent of the watersheds modeled, 3 sub-populations were shown to be even further disadvantaged (low-income White and Black populations in the southeast and tribal populations near the Great Lakes). Both of these results (the neurodevelopmental RfD-based analysis and the analysis of increased MI-mortality risk) suggest that subsistence fisher populations that are racially or culturally, geographically, and income-differentiated could experience elevated risks relative to not only the general population but also the population of subsistence fishers generally. We think that opportunities to remove systemic barriers to underserved communities are relevant considerations in determining the benefits of regulating EGU HAP.

5. Overview of Health and Environmental Effects Associated With Non-HAP Emissions From EGUs

Alongside the HAP emissions enumerated above, U.S. EGUs also emit a substantial quantity of criteria pollutants, including direct $PM_{2.5}$, nitrogen oxides (NO_X) (including NO_2), and SO_2, even after implementation of the ARP and numerous other CAA requirements designed to control criteria pollutants. In the 2011 RIA, for example, the EPA estimated that U.S. EGUs would emit 3.4 million tons of SO_2 and 1.9 million tons of NO_X in 2015 prior to implementation of any controls under MATS (see Table ES–2). These EGU SO_2 emissions were approximately twice as much as all other sectors combined (EPA SO_2 Integrated Science Assessment, 2017).[48] These pollutants contribute to the formation of $PM_{2.5}$ and ozone criteria pollutants in the atmosphere, the exposure to which is causally linked with a range of adverse

[47] Note that the RfD-based analysis described in the 2011 Final Mercury TSD and referenced here addressed the potential for neurodevelopmental effects in children and therefore focused on the ingestion of methylmercury by female subsistence fishers. By contrast, the analysis focusing on increased MI-mortality risk for subsistence fishers described in the 2021 Risk TSD and referenced here was broader in scope and encompassed all adult subsistence fishers.

[48] U.S. EPA. *Integrated Science Assessment for Sulfur Oxides—Health Criteria* (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–17–451, December 2017.

public health effects. SO_2 both directly affects human health and is a precursor to $PM_{2.5}$. Short-term exposure to SO_2 causes respiratory effects, particularly among adults with asthma. SO_2 serves as a precursor to $PM_{2.5}$, the exposure to which increases the risk of premature mortality among adults, lung cancer, new onset asthma, exacerbated asthma, and other respiratory and cardiovascular diseases. Likewise, EGU-related emissions of NO_X will adversely affect human health in the form of respiratory effects including exacerbated asthma. NO_X is a precursor pollutant to both $PM_{2.5}$ and ground-level ozone. Exposure to ozone increases the risk of respiratory-related premature death, new onset asthma, exacerbated asthma, and other outcomes. Fully accounting for the human health impacts of reduced EGU emissions under MATS entails quantifying both the direct impacts of HAP as well as the avoided premature deaths and illnesses associated with reducing these co-emitted criteria pollutants. Similarly, U.S. EGUs emit substantial quantities of CO_2, a powerful greenhouse gas (GHG): the EPA estimated these emissions at 2.23 million metric tpy in 2015 (2011 RIA, Table ES–2). The environmental impacts of GHG emissions are accounted for through the social cost of carbon, which can be used to estimate the benefits of emissions reductions projected in the 2011 RIA to occur under MATS.

Not all of the non-HAP benefits of MATS were quantified or monetized in the 2011 RIA. However, the EPA thoroughly documented these potential effects and identified those for which quantification and/or monetization was possible. Specifically, the EPA calculated the number and value of avoided $PM_{2.5}$-related impacts, including 4,200 to 11,000 premature deaths, 4,700 nonfatal heart attacks, 2,600 hospitalizations for respiratory and cardiovascular diseases, 540,000 lost work days, and 3.2 million days when adults restrict normal activities because of respiratory symptoms exacerbated by $PM_{2.5}$ (2011 RIA, p. ES–3). We also estimated substantial additional health improvements for children from reductions in upper and lower respiratory illnesses, acute bronchitis, and asthma attacks. In addition, we included in our monetized benefits estimates the effect from the reduction in CO_2 emissions resulting from this final action, based on the interagency SC–CO_2 estimates. These benefits stemmed from imposition of MATS and would be coincidentally realized alongside the HAP benefits.

6. Summary of Public Health and Environmental Hazards Associated With Emissions From EGUs

The EPA finds that the evidence provided in this section of the preamble, informed where possible with new scientific evidence available since the publication of the 2016 Supplemental Finding, once again demonstrates that HAP released from U.S. EGUs represent a significant public health hazard absent regulation under CAA section 112. As noted earlier, the EPA found that even after imposition of the other requirements of the CAA, EGUs were the largest domestic source of mercury, HF, HCl, and selenium and among the largest domestic contributors of arsenic, chromium, cobalt, nickel, hydrogen cyanide, beryllium, and cadmium. The EPA has documented a wide range of adverse health effects in children and adults associated with mercury including, in particular, neurodevelopmental effects in children exposed prenatally (*e.g.,* IQ, attention, fine motor-function, language, and visual spatial ability) and a range of cardiovascular effects in adults including fatal MI and non-fatal IHD. Non-mercury HAP have also been associated with a wide range of chronic health disorders (*e.g.,* decreased pulmonary function, pneumonia, or lung damage; detrimental effects on the central nervous system; and damage to the kidneys). Furthermore, 3 of the key metal HAP emitted by EGUs (arsenic, chromium, and nickel) have been classified as human carcinogens and there is evidence to suggest that, prior to MATS, emissions from these sources had the potential to result in cancer risks greater than 1-in-1 million.

Further, this section briefly describes the results from several new screening-level risk assessments considering mercury from domestic EGU sources. These risk assessments focused on 2 broad populations of exposure: (a) subsistence fishers exposed to mercury through self-caught fish consumption within the continental U.S. and (b) the general U.S. population exposed to mercury through the consumption of commercially-sourced fish (*i.e.,* purchased from restaurants and food stores). The results of these screening-level risk assessments are useful for informing our understanding about the potential scope and public health importance of these impacts, but remaining uncertainties prohibit precise estimates of the size of these impacts currently. For example, numerous studies considering multiple, large cohorts have shown that people exposed to high amounts of mercury are at higher risk of fatal and non-fatal cardiovascular disease. While U.S. EGUs are only one of multiple global sources that contribute to this mercury exposure, the EPA's screening analysis suggests the potential for U.S. EGU emissions of mercury to contribute to premature mortality in the general U.S. population.

Furthermore, as part of the subsistence fisher analyses, we included scenario modeling for a number of EJ-relevant populations showing that several populations (including low-income Blacks and Whites in the Southeast and tribal populations near the Great Lakes) had risk levels that were significantly above the general subsistence fisher population modeled for the entire U.S. As noted earlier, the EPA believes that Congress intended in CAA section 112 to address risks to the most exposed and most sensitive members of the public. These additional risk assessments suggest that there are populations that are particularly vulnerable to EGU HAP emissions, including populations of concern from an EJ standpoint.

MATS has played a critical role in reducing the significant volume and risks associated with EGU HAP emissions discussed above. Mercury emissions declined by 86 percent, acid gas HAP by 96 percent, and non-mercury metal HAP by 81 percent between 2010 (pre-MATS and certain market conditions) and 2017. See Table 4 at 84 FR 2689 (February 7, 2019). MATS is the only Federal requirement that guarantees a level of HAP control from EGUs. At the same time, the concomitant reductions in CO_2, NO_X, and SO_2, also provide substantial public health and environmental benefits. Given the numerous and important public health and environmental risks associated with EGU emissions, the EPA again concludes that the advantages of regulating HAP emissions from this sector are significant, and that is true whether we look at the HAP emissions reductions alone or the concomitant reduction in non-HAP emissions.

B. Cost Associated With Regulating EGUs for HAP

1. Introduction

In this action, the EPA considers the 2011 projected costs comprehensively, examining them in the context of the effect of those expenditures on the economics of power generation more broadly, the reliability of electricity, and the cost of electricity to consumers. These metrics are relevant to our weighing exercise because they give us a more complete picture of the

disadvantages to producers and consumers of electricity imposed by this regulation.

Similar to the EPA's consideration of benefits of regulation, our consideration of costs and disadvantages is specific to the unique charge in section 112(n)(1)(A) to determine whether EGU HAP regulation is appropriate and necessary, and the Supreme Court's direction in *Michigan* v. *EPA.* As the Court recognized, the EPA has discretion ''to decide (as always within the limits of reasonable interpretation) how to account for cost.'' *Michigan,* 135 S. Ct. at 2711. To reasonably exercise this discretion, the EPA considered the language and context of CAA section 112(n)(1) as well as the general goals of section 112 of the CAA. We note as well that the EPA routinely uses other methods to consider costs under other provisions of the statute, and that we are not in this action suggesting that the analysis appropriate to 112(n)(1)(A) finding is appropriate for any other statutory provisions.

As discussed in more detail below, the 2022 Proposal analyzed new cost information indicating that the cost projection used in the 2011 RIA and the 2016 Supplemental Finding likely significantly overestimated the actual costs of compliance of MATS by an amount in the billions of dollars. Specifically, with the benefit of hindsight, we now know that the EGU sector installed far fewer controls to comply with the HAP emissions standards than projected; certain modeling assumptions, if updated with newer information, would have resulted in a lower cost estimate; unexpected advancements in technology occurred; and the country experienced a dramatic increase in the availability of comparatively inexpensive natural gas. All of these factors likely resulted in a significantly lower actual cost of compliance than the EPA's projected estimates in 2011.

The EPA received numerous public comments on these analyses, and our detailed responses to these comments are presented in section IV.B below and in the 2023 RTC Document. No information received during the comment period has provided new data or methods to cause us to change the analytical approaches used in the 2022 Proposal to consider the costs of the MATS regulation. As a result, this final action will rely upon the same suite of qualitative and quantitative evidence presented in the 2022 Proposal. While the reader is directed to the 2022 Proposal and the supporting Cost TSD for the complete analyses, the EPA summarizes the analyses in subsequent sections of this preamble.

Additionally, in response to several commenters' suggestion for the EPA to consider employment impacts from EGU HAP regulation, the EPA notes that the 2011 RIA did consider employment impacts. As explained in further detail in section IV.B.2 below, the 2011 RIA projected both employment gains and losses as a result of the regulation but that the net projected change in employment due to MATS was ambiguous. Nonetheless, the EPA has taken such employment impacts into consideration in this final action and finds that they do not play a significant role in the EPA's decision making.

2. Compliance Cost Projections in the 2011 RIA Were Likely Significantly Overestimated

In evaluating the costs and disadvantages of MATS, the EPA begins with the costs to the power industry of complying with MATS. This assessment uses a sector-level (or system-level) accounting perspective to estimate the cost of MATS, looking beyond just pollution control costs for directly affected EGUs to include incremental costs associated with changes in fuel supply, construction of new capacity, and costs to non-MATS units that were also projected to adjust operating decisions as the power system adjusted to meet MATS requirements. Such an approach is warranted due to the nature of the power sector, which is a large, complex, and interconnected industry.

Using this broad view, the 2011 RIA projected that the compliance cost of MATS would be $9.6 billion per year in 2015.[49] However, there are inherent limits to what can be predicted *ex ante.* The cost estimate was made 5 years prior to full compliance with MATS, and stakeholders, including a leading power sector trade association, have indicated that our initial cost projection significantly overestimated actual costs expended by industry. Independent analyses provided to the EPA indicated that we may have overestimated the cost of MATS by billions of dollars per year. Moreover, there have been significant changes in the power sector in the time since MATS was promulgated that were not anticipated in either EPA or U.S. Energy Information Administration (EIA) projections at the time.[50] Entirely outside of the realm of EPA regulation, there were dramatic shifts in the cost of natural gas and renewables, as well as the implementation of new state policies and Federal tax incentives, which have also further encouraged construction of new renewable units. These have led to significantly faster and greater than anticipated retirements of coal-fired generating units.

While there are significant challenges to producing an *ex post* cost estimate that provides an apples-to-apples comparison to our 2011 cost projections, due to the complex and interconnected nature of the industry and the related difficulty of attributing costs to MATS or other factors, we approximated the extent of our overestimate in the 2022 Proposal. In the proposed rule, we reviewed a suite of quantitative and qualitative updates and considered studies that were performed by outside entities and concluded that the available *ex post* evidence points to significantly lower costs of compliance for the power sector under MATS than suggested by the *ex ante* projections in the 2011 RIA. The proposal explained that there are numerous reasons for this, and chief among them is the fact that the natural gas industry has undergone profound change in recent years.

As detailed in the 2022 Proposal and supporting Cost TSD, following the promulgation of MATS, natural gas supply increased substantially, leading to dramatic price decreases that resulted in major shifts in the economics of fossil fuel-fired electric generating technologies. The 2011 RIA modeling did not fully anticipate this historic change in natural gas supply and the related decrease in natural gas prices. As a result of this and other fundamental changes in the industry, we see a very different pattern of control installations than was projected:[51]

- 21 percent less capacity of dry FGD than projected;
- 64 percent less capacity of dry sorbent injection (DSI) than projected;
- 3 percent less capacity of activated carbon injection than projected;
- 69 percent less capacity of fabric filters than projected; and

[49] All costs were reported in 2007 dollars.

[50] In 2009, coal-fired generation was by far the largest source of utility scale generation, providing more power than the next two sources (natural gas and nuclear) combined. By 2016, natural gas had passed coal-fired generation as the leading source of generation in the U.S. While natural gas-fired generation, nuclear generation and renewable generation have all increased since 2009, coal-fired generation has significantly declined.

[51] As discussed in the proposal, although we assumed that all pollution controls of these types that were installed between 2013 and 2016 were singularly attributable to MATS requirements and we therefore attributed all costs associated with controls of these types to MATS in this analysis, this is a conservative assumptions given that some of the observed installations likely occurred in response to other regulations to control criteria air pollutants.

• Likely fewer electrostatic precipitator (ESP) and scrubber control upgrades than projected.

Installation and operation of these controls together were responsible for approximately 70 percent of the projected annual compliance costs in the 2011 RIA. Because so many projected controls were not installed, we know that the control-related costs were likely significantly overestimated. By simply comparing between projected and installed controls, we found in the 2022 Proposal that the projected control-related costs for 2015 of about $7 billion were likely overestimated by $2.2 to $4.4 billion, and possibly more.

In addition, since promulgation of MATS, the EPA has found it necessary to update some of the assumptions used in the modeling that informed the RIA cost estimate, in order to capture the most recently available information and best reflect the current state of the power sector.

Specifically:

• HCl emissions for EGUs burning subbituminous and lignite coals are much lower than assumed in 2011, reducing the number of controls necessary for compliance than was projected in 2011;

• DSI controls require less sorbent than assumed in 2011, lowering the operating cost of these controls, and other lower-cost sorbents are likely available; and

• The assumed cost of ESP upgrades in the 2011 analysis was likely much higher than the actual cost of these upgrades.

While not quantified here, the reductions in cost and advances in performance of control technology between the time of the EPA's 2011 modeling and implementation of the rule would, if quantified, likely add to the $2.2 to $4.4 billion overestimate for pollution control costs.

Three studies submitted to the EPA during earlier rulemakings support this finding that the 2011 RIA cost projection was significantly overestimated:

• Andover Technology Partners estimated that the actual annual costs of compliance with MATS were approximately $2 billion and stated that the 2011 RIA may have overestimated annual compliance costs by approximately $7 billion.

• M.J. Bradley & Associates used information from the EIA to estimate that owners and operators of coal-fired EGUs incurred total capital expenditures on environmental retrofits of $4.45 billion from December 2014 to April 2016. For comparison, the estimated total upfront (not annualized) capital expenditures underpinning the 2011 RIA annual compliance cost estimate is about $36.5 billion, which is more than eight times higher than the M.J. Bradley & Associates estimate of actual total capital expenditures.

• Edison Electric Institute, the association that represents U.S. investor-owned electric companies, estimated cumulative costs incurred by the industry in response to MATS of $18 billion over a 7-year period, suggesting an annual amount of about $2.6 billion (or, as the EPA notes in the 2022 Proposal, is about $7 billion less than the 2011 RIA projected).

The EPA received no data or analysis during the public comment period that alters the conclusions made in the 2022 Proposal based on the evidence presented in the proposed rule and summarized here. We thus finalize here our conclusion that the available *ex post* evidence points to a power sector that incurred significantly lower costs of compliance obligations under MATS than anticipated based on the *ex ante* projections when the rule was finalized in 2012. This overestimate was significant—for just one part of the original compliance cost estimate, the EPA was able to quantify a range of at least $2.2 to $4.4 billion in projected costs related to the installation, operation, and maintenance of controls which were not expended by industry. This projected overestimation is limited to these costs; it does not account for other ways in which the rule's costs were likely overestimated, such as advances in control technologies that made control applications less expensive or more efficient at reducing emissions. The other studies conducted by stakeholders asserted there were even greater differences between projected and actual costs of MATS, and further support the EPA's conclusions that the 2011 cost projections were likely significantly overestimated.

3. Evaluation of Metrics Related to MATS Compliance

The EPA next examines the *projected* cost of MATS—both total cost and specific types of costs—and we use sector-level metrics that put those cost estimates in context with the economics of the power sector. The reason we examine these metrics is to better understand the disadvantages that expending these costs had on the electricity generating industry and the public more broadly, and to understand these costs in the context of the sector that incurred them. Additionally, these metrics are relevant measures for evaluating costs to the utility sector in part because they are the types of metrics used in regulatory analysis as well as considered by the owners and operators of EGUs themselves.

For purposes of these analyses, the EPA uses the 2011 RIA *ex ante* projections, keeping in mind conclusions derived from newer *ex post* analyses which indicate the 2011 RIA cost projections were likely significantly overestimated. Specific to the power sector, we evaluate the projected costs of the rule relative to revenues from electricity sales across nearly 20 years. We compare the projected expenditures required under the rule with historic expenditures by the industry over the same time period. We also look at the projected effects of MATS on retail electricity prices and power sector generating capacity. Specifically, we examined the 2011 projected cost in the context of the following four metrics: compliance costs as a percent of power sector sales, compliance expenditures compared to the power sector's annual expenditures, impact on retail price of electricity, and impact on power sector generating capacity.

As discussed in the 2022 Proposal and presented in the Cost TSD, based on the 2011 RIA, the total projected cost of the MATS rule to the power sector in 2015 represented between 2.7 and 3.0 percent of annual electricity sales when compared to years from 2000 to 2019, a small fraction of the value of overall sales (and even smaller when one takes into account that the 2011 RIA projections were likely significantly overestimated). Looking at capital expenditures, the EPA demonstrated that the projected MATS capital expenditures in 2015 represented between 3.6 and 10.4 percent of total annual power sector capital expenditures when compared to years surrounding the finalization of the MATS rule. Such an investment by the power sector would comprise a small percentage of the sector's historical annual capital expenditures on an absolute basis and also would fall within the range of historical variability in such capital expenditures. Using data from U.S. Census Bureau, for example, the year-to-year variability in annual power sector capital expenditures ranged from a decrease in capital expenditures of $19.5 billion to an increase of $23.4 billion over this time (see Table A–5 of the Cost TSD). Similarly, the EPA demonstrated that the projected capital and operating expenditures in 2015 represented between 4.3 and 6.2 percent of total annual power sector capital and operating expenditures over 2000 to 2019 and is well within the substantial range of annual variability. Using

capital expenditure data from U.S. Census Bureau and production expenditure data from Hitachi Powergrids Velocity Suite, for example, the year-to-year variability in annual power sector capital and operating expenditures ranged from a decrease of $32.8 billion to an increase of $27.5 billion over this time (see Table A–6 of the Cost TSD). This action's analysis indicating that far fewer controls were installed than the EPA had projected is particularly relevant to considering our findings as to this metric; with the overestimation of capital expenditures in mind, actual investments by the power sector to comply with MATS would have comprised an even smaller percentage of historical annual capital expenditures.

With respect to impacts on the wider public, the EPA examined the projected impacts on average retail electricity prices and found the modest increases—which, like overall compliance costs, are also likely to have been significantly overestimated—to be within the range of historical variability. Additionally, these small retail price impacts would have occurred during a period in which national average retail electricity prices had fallen from 9.10 cents per kilowatt-hour in 2012 to 8.68 cents per kilowatt-hour in 2019 (see Table A–7 of the Cost TSD). Finally, previous analysis indicated that the vast majority of the generation capacity in the power sector would remain operational and that the power sector would be able to comply with the MATS requirements while maintaining its ability to generate, transmit, and distribute reliable electricity at reasonable cost to consumers. We have seen no evidence to contradict those findings.

The EPA is finalizing the determination that each of these analyses are appropriate bases for evaluating the costs conferred by the MATS-related projected compliance expenditures. As we note above, even though the projected costs we use in this analysis are likely significantly overestimated, we find that they are still relatively small when placed in the context of the economics of the industry, and well within historical variations. Again, we received no data or analysis during the public comment period that alters the conclusions made in the 2022 Proposal based on the evidence just presented.

4. Other Cost Considerations

We also reaffirm our previous findings regarding the costs of mercury controls, consistent with the instruction from the statute to study the availability and cost of such controls in CAA section 112(n)(1)(B). 80 FR 75036–37 (December 1, 2015). We similarly reaffirm our previous records and findings regarding the cost of controls for other HAP emissions from EGUs, and the cost of implementing the utility-specific ARP, which Congress wrote into the 1990 CAA Amendments and implementation of which Congress anticipated could result in reductions in HAP emissions. *Id.* With respect to the costs of technology for control of mercury and non-mercury HAP, the record evidence shows that in 2012 controls were available and routinely used and that control costs had declined considerably over time. *Id.* at 75037–38. With regard to the ARP, industry largely complied with that rule by switching to lower-sulfur coal rather than installing more costly pollution controls, and subsequently the actual costs of compliance were substantially lower than projected. Though the reasons for discrepancies between projected and actual costs are different for MATS than they were for the ARP, as discussed in section III.B.2 above, the newer information examined as part of this action demonstrates that the projected cost estimates for MATS were also likely significantly overestimated.

5. Conclusion

Section III.B.2 summarizes our finding that the 2011 RIA costs were likely significantly overestimated. Section III.B.3 summarizes our evaluation of the cost metrics related to MATS compliance, and concludes that even though the cost estimates we used in this analysis were likely significantly overestimated, they were relatively small when placed in the context of the industry's revenues and expenditures, and well within historical variations. Similarly, we conclude that the projected impact on average retail electricity price was within the range of historical variability. We also note in section III.B.3 that previous analysis indicated that the vast majority of the generation capacity in the power sector would remain operational and that the power sector would be able to comply with the MATS requirements while maintaining its ability to generate, transmit, and distribute reliable electricity at reasonable cost to consumers. We have seen no evidence to contradict those findings. In section III.B.4, we reaffirm additional cost considerations regarding the availability and cost of control technologies discussed in earlier rulemakings.

C. Revocation of the 2020 Final Action

We are revoking the 2020 Final Action because we find that the framework used to consider cost in 2020 was ill-suited to making the appropriate and necessary determination in the context of CAA section 112(n)(1)(A) specifically and the CAA section 112 program generally. The 2020 Final Action focused on a comparison of costs to *monetized* HAP benefits, which was not required nor supported by the statutory text of CAA section 112(n)(1)(A) and legislative history. Accordingly, we exercise our discretion to adopt a different approach. We also disagree with the conclusions presented in the 2020 Final Action as to the 2016 Supplemental Finding's two approaches.

The 2020 Final Action established a three-step framework for making the appropriate and necessary determination, which it deemed at the time as the appropriate method for the EPA to determine whether it was appropriate and necessary to regulate EGUs under CAA section 112(n)(1)(A). Under this framework, the EPA first ''compare[d] the monetized costs of regulation against the subset of HAP benefits that could be monetized''; second, it ''consider[d] whether unquantified HAP benefits may alter that outcome''; and third ''the EPA consider[d] whether it is appropriate, notwithstanding the above, to determine that it is 'appropriate and necessary' to regulate EGUs under CAA section 112(n)(1)(A) out of consideration for the PM co-benefits that result from such regulation.'' 85 FR 31302 (May 22, 2020).

Applying the first part of the framework, the EPA noted that the costs of regulation estimated in the 2011 RIA were disproportionately higher—by three orders of magnitude—than the *monetized* HAP benefits, and concluded ''[t]hat does not demonstrate 'appropriate and necessary.' '' *Id.* Under the framework's second inquiry, the EPA determined that the unquantified HAP benefits, even if monetized, were unlikely to alter its conclusion under the first part of the framework. *Id.;* see also 85 FR 31304 (noting that ''valuing HAP-related morbidity outcomes would not likely result in estimated economic values similar to those attributed to avoiding premature deaths''). Finally, applying the third part of its framework, the EPA noted that nearly all of the monetized benefits of MATS as reflected in the 2011 RIA were derived from PM benefits. See 85 FR 31302–03 (May 22, 2020). The EPA then posited that, ''[h]ad the HAP-specific benefits of MATS been closer to the costs of regulation, a different question might have arisen as to whether the Administrator could find that co-

benefits legally form part of the justification for determination that regulation of EGUs under CAA section 112(d) is appropriate and necessary.'' See 85 FR 31303 (May 22, 2020). However, because of the factual scenario presented in the record, the EPA in the 2020 Final Action stated that ''[t]he EPA does not need to, and does not, determine whether that additional step would be appropriate . . . given that the monetized and unquantified HAP-specific benefits do not come close to a level that would support the prior determination.'' *Id.* In conclusion, the EPA stated that ''[u]nder the interpretation of CAA section 112(n)(1)(A) that the EPA adopts in this action, HAP benefits, as compared to costs, must be the primary question in making the 'appropriate and necessary' determination.'' *Id.*

We find that this three-step framework is an unsuitable approach to making the appropriate and necessary determination under CAA section 112(n)(1)(A) because it places undue primacy on those HAP benefits that have been monetized, and fails to consider critical aspects of the inquiry posed to the EPA by Congress in CAA section 112(n)(1). While the 2020 Final Action purported to consider unquantified HAP benefits at step 2, it failed to square that consideration with the difficulty of monetizing and the potential magnitude of these benefits, as discussed in section III.A.3 above, and with the statutory structure. Moreover, the 2020 three-step framework also did not in any meaningful way grapple with the bases upon which the EPA had relied to design the 2016 preferred approach, as discussed above, including the broad statutory purpose of CAA section 112 to reduce the volume of HAP emissions with the goal of reducing the risk from HAP emissions to a level that is protective of even the most exposed and most sensitive subpopulations; the fact that we rarely can fully characterize or quantify risks at a nationwide level; the fact that except for one of the many health endpoints for only one of the many HAP emitted from EGUs, the EPA lacked the information necessary to monetize any benefit of reductions in HAP emissions; and the fact that health endpoints and other key benefits may be highly significant even if they cannot currently be fully quantified or monetized. The sole rationale provided in the 2020 Final Action for rejecting the relevance of the statute's clear purpose as evinced in the broader CAA section 112 program and reflected in the provisions of CAA section 112(n)(1) was that CAA section 112(n)(1)(A) is a separate provision and threshold determination. See 85 FR 31293–94 (May 22, 2020). But we do not think it is sensible to view the statute's direction to the EPA to make a separate determination as to EGUs as an invitation to disregard the statutory factors of CAA section 112(n)(1),the greater statutory context in which that determination exists, and the urgency with which Congress directed the EPA to regulate HAP emissions in the 1990 amendments, and we do not think that the 2020 Final Action provided an adequately reasoned basis for abandoning the interpretation and assessment provided in the 2016 Supplemental Finding. And in any event, we believe the methodology we are finalizing in this action is better suited to making the statutory finding than the 2020 framework.

In the 2020 rulemaking, the EPA did not explain its rationale for its decision to anchor the appropriate and necessary determination at step one as a comparison between the monetized costs of regulation and *monetized* HAP-specific benefits. Rather, the proposed and final rules repeatedly state that the ''primary'' inquiry in the determination should be a comparison of costs and HAP benefits, but did not explain why only *monetized* HAP benefits should be given primacy. See, *e.g.,* 85 FR 31286, 31288, 31303 (May 22, 2020). Given the EPA's recognition of the broad grant of discretion inherent in the phrase ''appropriate and necessary,'' see 81 FR 24430–31 (April 25, 2016), its acknowledgement of Congress' ''particularized focus on reducing HAP emissions and addressing public health and environmental risks from those emissions'' in CAA section 112, see 85 FR 31299 (May 22, 2020), and its knowledge and recognition that the monetized value of one of its points of comparison represented but a small subset of the advantages of regulation, see 85 FR 31302 (May 22, 2020), we now believe it was inappropriate to adopt a framework that first and foremost compared monetized value to monetized value alone. Nothing in the CAA or the Supreme Court's decision in *Michigan* v. *EPA* required the EPA's decision in 2020 to hinge its framework on monetized HAP benefits.

The EPA's consideration of the non-monetized benefits of MATS in 2020 (*i.e.,* the various endpoints discussed in section III.A, including virtually all of the HAP benefits associated with this final action) occurred only at step two, where the EPA considered whether the unquantified benefits, if monetized, were ''likely to overcome the imbalance between the monetized HAP benefits and compliance costs in the record.'' See 85 FR 31296 (May 22, 2020). This approach undervalues the vast array of adverse health and environmental impacts associated with HAP emissions from coal- and oil-fired EGUs that have been enumerated by the EPA [52] and the social value (benefit) of avoiding those impacts through regulation by considering them at a second-step of the framework and summarily dismissing such impacts and benefits as unlikely to overcome costs without sufficient analysis. Indeed, while the 2020 Final Action claimed that unquantified HAP benefits associated with regulating EGUs were significant, as discussed further below, it disregarded certain health and welfare risks associated with HAP emissions and gave incomplete consideration to others.

Further, the three-step framework gave no consideration to the important statutory objective of protecting the most at-risk subpopulations. As noted above, throughout CAA section 112, Congress placed special emphasis on regulating HAP from sources to levels that would be protective of those individuals most exposed to HAP emissions and most sensitive to those exposures as discussed in section II.B.2 above. The rigid and narrow approach to making the appropriate and necessary determination in the 2020 Final Action is at odds with the text and purpose of CAA section 112, and is certainly not required under the express terms of CAA section 112 or CAA section 112(n)(1)(A).

We note as well that the three-step framework employed by the 2020 Final Action is not a formal BCA conforming to recognized principles (see, *e.g.,* OMB Circular A–4,[53] EPA Guidelines for Preparing Economic Analyses [54]). BCA is a specific tool developed by economists to assess total society-wide benefits and costs, to determine the economic efficiency of a given action. Instead of conforming to this comprehensive approach, the first step—and, as applied in the 2020 Final Action, the most important step—of the three-step framework focused primarily

[52] See, *e.g.,* 65 FR 79829–30 (December 20, 2000); 76 FR 24983–85, 24993–97, 24999–25001, 25003–14, 25015–19 (May 3, 2011).

[53] U.S. OMB. 2003. *Circular A–4 Guidance to Federal Agencies on Preparation of Regulatory Analysis.* Available at *https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf,* accessed September 2, 2022.

[54] U.S. EPA. 2014. *Guidelines for Preparing Economic Analyses.* EPA–240–R–10–001. National Center for Environmental Economics, Office of Policy. Washington, DC. December. Available at *https://www.epa.gov/environmental-economics/guidelines-preparing-economic-analyses,* accessed July 23, 2021.

on comparing the rule's total costs to a very small subset of HAP benefits that could be monetized. The EPA largely dismissed and at most gave only secondary weight to the vast majority of the benefits of regulating HAP emissions from stationary sources that cannot currently be quantified, and completely ignored the non-HAP monetized benefits directly attributable to the MATS rule which was contrary to both economic principles for cost-benefit analysis and the Supreme Court's direction to consider ''all the relevant factors'' in making the appropriate and necessary finding. *Michigan* v. *EPA,* 576 U.S. at 752.

Commenters on the 2019 Proposal (84 FR 2670 (February 7, 2019)) objected strenuously to the EPA's revised framework for making the appropriate and necessary determination, arguing that the 2019 Proposal's interpretation ''fails to meaningfully address factors that are 'centrally relevant' to the inquiry of whether it is appropriate and necessary to regulate HAP from EGUs,'' and that the EPA's new interpretation must fall because the EPA failed to provide a reasoned explanation for its change in policy, as required by *Motor Vehicle Mfrs. Ass'n of United States, Inc.* v. *State Farm Mut. Automobile Ins. Co.,* 463 U.S. 29 (1983), and *FCC* v. *Fox Television Stations, Inc.,* 556 U.S. 502 (2009). See 85 FR 31294 (May 22, 2020). Among the factors that commenters argued had been inadequately addressed under the new framework were the ''hazards to public health reasonably anticipated to occur'' that had not been monetized; the non-monetizable benefits of HAP regulation such as the latency, persistence in the environment, and toxicity of HAP as recognized by Congress; the distributional impacts on particular communities and individuals most impacted by HAP emitted from power plants; and preservation of tribal social practices. In responses to these comments, the EPA claimed that it was not ''disregarding'' or ''dismissing'' the concerns raised by the commenters, but rather simply weighing them differently, and explained that the Administration's changed priorities provided the ''reasoned basis'' for its changed interpretation. See 85 FR 31296–97 (May 22, 2020).

Agencies do have broad discretion to re-evaluate policies and change their ''view of what is in the public interest,'' *State Farm,* 463 U.S. at 57, but such re-evaluations must still adhere to principles of reasoned decision-making. The 2020 Final Action did not aver that the statute prohibited the EPA from considering the factors commenters identified in making its appropriate and necessary determination, *e.g.,* non-monetized benefits. Instead, the EPA stated that it was permitted to pick its decisional framework and admitted that its decisional framework might undervalue certain factors. For example, with respect to commenters' concerns that the revised appropriate and necessary framework did not adequately account for adverse impacts on tribal culture or undue concentration of public health risks on certain population subgroups or individuals, the EPA stated: ''In a cost-benefit comparison, the overall amount of the benefits stays the same no matter what the distribution of those benefits is.'' 85 FR 31297 (May 22, 2020). There, the EPA found it ''reasonable to conclude that those factors to which the EPA previously gave significant weight–including qualitative benefits, and distributional concerns and impacts on minorities–will not be given the same weight in a comparison of benefits and costs for this action under CAA section 112(n)(1)(A).'' The decisional framework in the 2020 Final Action, however, did not give ''less weight'' to these factors—it effectively gave them none. In both the selection and application of its framework, the EPA in the 2020 Final Action effectively ignored these factors altogether, and we do not agree that the inability to monetize a factor should render it unimportant. *Cf. Am. Trucking Ass'ns, Inc.* v. *EPA,* 175 F.3d 1027, 1052–53 (D.C. Cir. 1999), reversed in part on other grounds in *Whitman* v. *Am. Trucking Ass'ns,* 531 U.S. 457 (2001) (holding that the EPA was not permitted to ignore information ''because the . . . benefits are difficult, if not impossible, to quantify reliably and because there is 'no convincing basis for concluding that any such effects . . . would be significant' ''); *Pub. Citizen* v. *Fed. Motor Carrier Safety Admin.,* 374 F.3d 1209, 1219 (D.C. Cir. 2004) (''The mere fact that the magnitude of . . . effects is *uncertain* is no justification for *disregarding* the effect entirely.'') (emphasis in original). The mere mention and summary dismissal of factors does not constitute meaningful consideration of those factors.

In the 2020 Final Action, like the 2016 Supplemental Finding before it, the EPA maintained that there is more than one permissible way to interpret the EPA's obligation to consider cost in the appropriate and necessary determination. Given the EPA's knowledge of the significant risks and often irreversible impacts of HAP exposure on vulnerable populations like developing fetuses, the disproportionate impact of EGU HAP emissions on communities who subsist on freshwater fish due to cultural practices and/or economic necessity, and the record of data demonstrating risks to public health amassed over decades, and, perhaps more importantly, the overwhelming quantity of advantages to regulation that could not be monetized, we do not think that selecting a framework that compared first and foremost monetized HAP benefits alone with costs was appropriate. And even if the framework ultimately addressed the statutorily relevant factors because at the second step the EPA ''acknowledged'' these benefits and claimed they were ''relevant,'' we think that the application of that second step fell short, and that the framework we propose in this document is a more appropriate framework for making the determination of appropriateness.

The secondary consideration of non-monetized HAP benefits in the three-step framework only considered HAP-related impacts of regulation insofar as the EPA speculated about what the monetized value of those benefits might be. See 85 FR 31296 (May 22, 2020) (asserting that monetized value of avoiding morbidity effects such as neurobehavioral impacts is ''small'' compared to monetized value associated with avoided deaths). The EPA did not, at this second step, grapple with the existing risk analyses, including those stemming from the statutorily mandated studies in CAA section 112(n)(1). Those analyses demonstrated substantial public health and environmental hazards, even if the hazards were not translated into monetized benefits. *See White Stallion,* 748 F.3d at 1245. While the EPA alluded to some of these risks, the EPA in 2020 ignored important health and welfare hazards documented in the record. For example, endpoints such as delayed infant brain development, increased potential for acute and chronic lung and kidney disorders, as well as adverse effects on wildlife and essential ecosystem services were not acknowledged in the 2020 second step determination. And even for those risks it did consider, that consideration was incomplete. For example, the 2020 Final Action concluded that any benefits accruing to a reduction in premature mortality as a result of reduced HAP emissions was unlikely to be significant. As discussed in section III.A.3 above, and in more detail in the 2021 Risk TSD, recent analyses performed by the EPA conclude that the benefit of avoiding such effects for a single endpoint (avoided MI deaths for the general U.S.

population from mercury exposure through fish consumption) could be as high as $720 million per year.

The EPA also did not explain why other attributes of risk—such as impacts on vulnerable populations, which the EPA is considering in this rulemaking as discussed in section III.A, and the reality that HAP emissions from EGUs are not distributed equally across the population but disproportionately impacts some individuals and communities far more than others—were unimportant, stating only that the selected framework did not accommodate consideration of those factors. The EPA did not acknowledge in any way the importance the statute places on these effects, which is discussed in section II.B.2 above.

As noted, the EPA did not point to anything in the CAA as supporting the use of its three-step framework. This is in stark contrast to the 2016 Supplemental Finding rulemaking, in which the EPA examined CAA section 112(n)(1)(A) and the other section 112(n)(1) provisions, and the rest of CAA section 112 generally, and D.C. Circuit case law on CAA cost considerations to inform the EPA's interpretation of CAA section 112(n)(1)(A). See 80 FR 75030 (December 1, 2015); 2015 Legal Memorandum. In the 2020 Final Action, the EPA merely asserted that a comparison of benefits to costs is ''a traditional and commonplace way to assess costs'' and claimed that the Supreme Court's holding in *Entergy Corp.* v. *Riverkeeper,* 556 U.S. 208 (2009) supported the EPA's 2020 position that, absent an unambiguous prohibition to use a BCA, an agency may generally rely on a BCA as a reasonable way to consider cost. See 85 FR 31293 (May 22, 2020). The 2020 Final Action also pointed out ''many references comparing'' costs and benefits from the *Michigan* decision, including: ''EPA refused to consider whether the costs of its decision outweighed the benefits'' (576 U.S. at 743); ''[o]ne would not say that it is rational, never mind 'appropriate,' to impose billions of dollars in economic costs in return for a few dollars in health or environmental benefits'' (*Id.* at 752); and ''[n]o regulation is 'appropriate' if it does more harm than good'' (*Id.*).

But while we agree that a comparison of benefits to costs is a traditional way to assess costs, the 2020 framework was not a BCA as understood in the economics literature and in OMB and EPA guidance. There is no economic theory or guidance of which we are aware that endorses the approach to comparing certain benefits to costs presented in the 2020 Final Action, in which the first—and, as applied, most important—step entails comparing total costs with a small subset of total benefits. See section III.E for further discussion. Moreover, general support for weighing costs and benefits does not justify placing undue weight on monetized HAP benefits, with secondary consideration for all other benefits for which monetary values cannot be calculated. As noted in Justice Breyer's concurrence in *Entergy Corp.,* the EPA has the ability ''to describe environmental benefits in non-monetized terms and to evaluate both costs and benefits in accordance with its expert judgment and scientific knowledge,'' and to engage in this balancing outside of ''futile attempts at comprehensive monetization.'' 556 U.S. at 235 (Breyer, J., concurring). Benefits—the advantages of regulation—can encompass outcomes that are not or cannot be expressed in terms of dollars and cents, just as the Court found that '' 'cost' includes more than the expense of complying with regulations; any disadvantage could be termed a cost.'' *Michigan,* 576 U.S. at 752. And the Court faulted the EPA's interpretation for ''preclud[ing] the Agency from considering *any* type of cost—including, for instance, harms that regulation might do to human health or the environment. . . . No regulation is 'appropriate' if it does significantly more harm than good.'' *Id.* The constricted view of benefits that the EPA adopted in 2020 was ill-suited to the statutory inquiry as interpreted in *Michigan.*

The primary basis in the 2020 action upon which the EPA relied to find that the 2016 preferred approach was flawed was that the preferred approach failed to ''satisf[y] the Agency's obligation under CAA section 112(n)(1)(A) as interpreted by the Supreme Court in *Michigan.*'' See 84 FR 2674 (February 7, 2019). The 2019 Proposal claimed that the chief flaw of the preferred approach was the EPA's failure to ''meaningfully consider cost within the context of a regulation's benefits,'' asserting that the *Michigan* Court contemplated that a proper consideration of cost would be relative to benefits. See 84 FR 2675 (February 7, 2019). But that is not an accurate characterization of the 2016 preferred approach, wherein the EPA weighed the existing record from 2012 demonstrating that HAP emissions from EGUs pose a number of identified hazards to both public health and the environment remaining after imposition of the ARP and other CAA requirements against the cost of MATS. See 81 FR 24420 (April 25, 2016) (''After evaluating cost reasonableness using several different metrics, the Administrator has, in accordance with her statutory duty under CAA section 112(n)(1)(A), weighed cost against the previously identified advantages of regulating HAP emissions from EGUs—including the agency's prior conclusions about the significant hazards to public health and the environment associated with such emissions and the volume of HAP that would be reduced by regulation of EGUs under CAA section 112.''). The 2020 Final Action further stated that the preferred approach was an ''unreasonable'' interpretation of CAA section 112(n)(1)(A) and impermissibly de-emphasized the importance of the cost consideration in the appropriate and necessary determination. See 85 FR 31292 (May 22, 2020). Instead, it is the 2020 Final Action—a decisional framework which rests primarily upon a comparison of the costs of a regulation and the small subset of HAP benefits which could be monetized—that does not ''meaningfully consider[s] cost within the context of a regulation's benefits,'' 85 FR 31294, because such a narrow approach relegates as secondary (and in application appeared to ignore altogether) the vast majority of that rule's HAP benefits and other advantages, as discussed above. We therefore revoke the 2020 three-step approach and determination because we do not think it is a suitable way to assess the advantages and disadvantages of regulation under CAA section 112(n)(1)(A) and in applying it, the EPA failed to meaningfully address key facts in the existing record. Even if the EPA's selection of the 2020 framework could be considered a permissible interpretation of the broad ''appropriate and necessary'' determination in CAA section 112(n)(1)(A), we exercise our discretion under the statute and as described in *Michigan,* to approach the determination differently.

D. The Administrator's Preferred Framework and Conclusion

The Administrator is finalizing his preferred, totality-of-the-circumstances approach, exercising his discretion under the statute identified by the Supreme Court, as the best and most reasonable way to ''pay attention to the advantages *and* disadvantages of [our] decision,'' *Michigan,* 576 U.S. at 753, in determining whether it is appropriate to regulate coal- and oil-fired EGUs under section 112 of the CAA. This approach, including which factors we consider and how much weight we give them, is informed by Congress' design of CAA

section 112(n)(1) specifically, and CAA section 112 generally. This approach considers and weighs the benefits of regulation against the disadvantages, without analytically distinguishing between monetizable and non-monetizable benefits or costs.

Specifically, under this approach we first consider and weigh the advantages of reducing HAP emissions from EGUs via regulation under section 112 of the CAA. We focus on the public health advantages of reducing HAP emissions because in CAA section 112(n)(1)(A), Congress specifically directed the EPA to find whether regulation of EGUs under CAA section 112 is appropriate and necessary after considering the results of the ''study of hazards to public health reasonably anticipated to occur as a result of emissions'' by EGUs. We also consider the other studies commissioned by Congress in CAA sections 112(n)(1)(B) and (C) and the types of information the statute directed the EPA to examine under those provisions—the rate and mass of EGU mercury emissions, the health and environmental effects of such emissions, and the threshold level of mercury concentrations in fish tissue which may be consumed (even by sensitive populations) without adverse effects to public health.[55] We place considerable weight on the factors addressed in the studies required in the other provisions of CAA section 112(n)(1) following from the Supreme Court's direction in *Michigan* v. *EPA,* and find it is reasonable to conclude that the information in those studies is important and relevant to a determination of whether HAP emissions from EGUs should be regulated under CAA section 112.[56] In *Michigan,* the Supreme Court stated that ''statutory context reinforces the relevance of costs'' and noted the studies required under CAA sections 112(n)(1)(B) and (C) were a further indication of the relevance of costs in the EPA's determination in the EPA's decision to regulate. 576 U.S. at 753–54. The EPA interprets the Court's emphasis that these studies reinforced the relevance of costs, as evidence that other factors contemplated by these studies should also be considered in the appropriate and necessary determination.

Notably, the studies required by CAA section 112(n)(1) place importance on the same considerations that are expressed in the terms and overall structure of CAA section 112. For example, CAA section 112(n)(1)(A) and section 112(n)(1)(B) make clear that the amount of HAP emissions from EGUs is an important consideration: section 112(n)(1)(A) by requiring the EPA to estimate the risk remaining after imposition of the ARP and other CAA requirements, and section 112(n)(1)(B) by requiring the EPA's study to ''consider the rate and mass of mercury emissions.'' Therefore, we believe it is reasonable to conclude that we should consider and weigh the volume of toxic pollution EGUs contributed to our air, water, and land absent regulation under CAA section 112, in total and relative to other domestic anthropogenic sources, and the potential to reduce that pollution, thus reducing its grave harms. In addition, the clear directive in CAA section 112(n)(1)(C) and elsewhere in section 112 to consider risks to the most exposed and susceptible populations, *e.g.,* the listing and delisting provisions and residual risk review discussed in section II.B.2, supports our decision to place significant weight on reducing the risks of HAP emissions from EGUs to the most sensitive members of the population (*e.g.,* developing fetuses and children), and communities that are reliant on self-caught local fish for their survival (*i.e.,* subsistence fisher populations who are more highly exposed than most due to higher rates of fish consumption). Finally, we also consider the identified risks to the environment posed by mercury and acid-gas HAP, consistent with CAA section 112(n)(1)(B) and the general goal of CAA section 112 to address adverse environmental effects posed by HAP emissions. See CAA section 112(a)(7) (defining ''adverse environmental effect'').

We next examine the costs and disadvantages of regulation. As with the advantages side of the equation, where we consider the consequences of reducing HAP emissions to human health and the environment, we consider the consequences of these expenditures for the electricity generating sector and society as informed by the broad range of factors the EPA is required to consider under the CAA section 112(n)(1)(A) determination. We therefore consider compliance costs comprehensively, placing them in the context of the effect those expenditures have on the economics of power generation more broadly, the reliability of electricity, and the cost of electricity to consumers. These metrics are relevant to our weighing exercise because they give us a more complete picture of the disadvantages to society imposed by this regulation, and because our conclusion might change depending on how this burden affects the ability of the industry to provide reliable, affordable electricity. Consistent with CAA section 112(n)(1)(B), this analysis further considers the costs and availability of technologies to control mercury emissions. This analysis includes a discussion of how the power sector complied with the ARP at a much lower cost than estimated in large part because many EGUs switched to use of low-sulfur coal instead of installing flue gas desulfurization scrubbers. This resulted in far fewer reductions in HAP emissions than would have occurred if more EGUs had installed scrubbers as predicted.

Below, consistent with this framework, we consider and weigh the advantages of regulating against the costs and disadvantages of doing so, giving particular weight to our examination of the public health hazards we reasonably anticipate to occur as a result of HAP emissions from EGUs, and the risks posed by those emissions to exposed and vulnerable populations. We note as well that had we found regulation under CAA section 112 to impose significant barriers to provision of affordable and reliable electricity to the public, this would have weighed heavily in our decision. In this weighing process, the fact that we describe the benefits first does not mean that we are in any way downplaying the costs in our ultimate conclusion. Were we to consider the costs first and the benefits second, our conclusion would not change.

We acknowledge, as we recognized in the 2016 preferred approach, that this approach to making the appropriate and necessary determination is an exercise in judgment, and that ''[r]easonable people, and different decision-makers, can arrive at different conclusions under the same statutory provision,'' (81 FR 24431; April 25, 2016), but this type of weighing of factors and circumstances is an inherent part of regulatory decision-making. As noted in then-Judge Kavanaugh's dissent in *White Stallion,* ''All regulations involve tradeoffs, and . . . Congress has assigned EPA, not the courts, to make many discretionary calls to protect both our country's environment and its productive capacity.'' 748 F.3d at 1266 (noting as well that ''if EPA had decided, in an

[55] CAA section 112(n)(1)(B) also directs the EPA to study available technologies for controlling mercury and the cost of such controls, and we consider those in our assessment of cost.

[56] The statute directed the EPA to complete all three CAA section 112(n)(1) studies within 4 years of the 1990 Amendments, expressing a sense of urgency with regard to HAP emissions from EGUs on par with addressing HAP emissions from other stationary sources. See CAA section 112(e) (establishing schedules for setting standards on listed source categories as expeditiously as practicable, but no later than between 2–10 years).

exercise of its judgment, that it was 'appropriate' to regulate electric utilities under the MACT program because the benefits outweigh the costs, that decision would be reviewed under a deferential arbitrary and capricious standard of review''). Bright-line tests and thresholds are not required under the CAA's instruction to determine whether regulation is ''appropriate and necessary,'' nor have courts interpreted broad provisions similar to CAA section 112(n)(1)(A) in such manner. In *Catawba Cty.* v. *EPA,* the D.C. Circuit held that ''[a]n agency is free to adopt a totality-of-the-circumstances test to implement a statute that confers broad authority, even if that test lacks a definite 'threshold' or 'clear line of demarcation to define an open-ended term.' '' 571 F.3d 20, 37 (D.C. Cir. 2009).

In undertaking this analysis, we are cognizant that, while the EPA has been studying the science underlying this determination for decades, the understanding of risks, health, and environmental impacts associated with toxic air pollution continues to evolve. In this document, we explained the additional information that has become available to the EPA since we performed our national analyses of the burdens associated with mercury pollution and emissions from EGUs for the 2012 rulemaking, and explained why, despite the certainty of the science demonstrating substantial health risks, we are unable at this time to quantify or monetize many of the effects associated with reducing HAP emissions from EGUs.[57] We continue to think it is appropriate to give substantial weight to these public health impacts, even where we lack information to precisely quantify or monetize those impacts. As the D.C. Circuit stated in *Ethyl Corp.* v. *EPA,*

> ''Where a statute is precautionary in nature, the evidence difficult to come by, uncertain, or conflicting because it is on the frontiers of scientific knowledge, the regulations designed to protect public health, and the decision that of an expert administrator, we will not demand rigorous step-by-step proof of cause and effect. . . . [I]n such cases, the Administrator may assess risks. . . . The Administrator may apply his expertise to draw conclusions from suspected, but not completely substantiated, relationships between facts, from trends among facts, from theoretical projections from imperfect data, from probative preliminary data not yet certifiable as 'fact,' and the like.''

541 F.2d 1, 28 (D.C. Cir. 1976). *See also Lead Industries Ass'n* v. *EPA,* 647 F.2d 1130, 1155 (D.C. Cir. 1980) (''[R]equiring EPA to wait until it can conclusively demonstrate that a particular effect is adverse to health before it acts is inconsistent with both the [Clean Air] Act's precautionary and preventive orientation and the nature of the Administrator's statutory responsibilities.'').

The EPA is not alone in needing to make difficult judgments about whether a regulation that has a substantial economic impact is ''worth it,'' in the face of uncertainty such as when the advantages of the regulation are hard to quantify in monetary terms. The Transportation Security Administration (TSA), when determining whether to require Advanced Imaging Technology at certain domestic airports, faced assertions that the high cost of widespread deployment of this type of screening was ''not worth the cost.'' TSA acknowledged that it did not ''provide monetized benefits'' or ''degree of benefits'' to justify the use of the screening but noted that the agency ''uses a risk-based approach . . . in order to try to minimize risk to commercial air travel.'' See 81 FR 11364, 11394 (March 3, 2016). The agency pointed out that it could not consider ''only the most easily quantifiable impacts of a terrorist attack, such as the direct cost of an airplane crashing,'' but rather that it had an obligation to ''pursue the most effective security measures reasonably available so that the vulnerability of commercial air travel to terrorist attacks is reduced,'' noting that some commenters were failing to consider the more difficult to quantify aspects of the benefits of avoiding terrorist attacks, such as ''substantial indirect effects and social costs (such as fear) that are harder to measure but which must also be considered by TSA when deciding whether an investment in security is cost-beneficial.'' *Id.*

In reviewing agency decisions like these, the courts have cautioned against ''substitut[ing] [their] judgment[s] for that of the agenc[ies],'' *State Farm,* 463 U.S. at 43 (1983), and ''[t]his is especially true when the agency is called upon to weigh the costs and benefits of alternative policies,'' *Center for Auto Safety* v. *Peck,* 751 F.2d 1336, 1342 (D.C. Cir. 1985). *See also United Church of Christ* v. *FCC,* 707 F.2d 1413, 1440 (D.C. Cir. 1983) (''[C]ost benefit analyses epitomize the types of decisions that are most appropriately entrusted to the expertise of an agency.''). This applies even where, or perhaps particularly where, costs or benefits can be difficult to quantify. For example, in *Consumer Elecs. Ass'n* v. *FCC,* the D.C. Circuit upheld the Federal Communication Commission's (FCC) mandate to require digital tuners, finding reasonable the Commission's identification of benefits, that is, ''principally speeding the congressionally-mandated conversion to DTV and reclaiming the analog spectrum,'' coupled with the FCC's ''adequate[ ] estimate[of] the long-range costs of the digital tuner mandate within a range sufficient for the task at hand . . . and [its finding of] the estimated costs to consumers to be 'within an acceptable range.' '' 347 F.3d 291, 303–04 (D.C. Cir. 2003) (''We will not here second-guess the Commission's weighing of costs and benefits.'').

Similarly, the Food and Drug Administration, in weighing the costs and benefits of deeming electronic cigarettes to be ''tobacco products,'' described the benefits qualitatively, '' 'potentially coming from' . . . premarket review [*i.e.,* the statutory consequence of deeming], which will result in fewer harmful or additive products from reaching the market than would be the case in the absence of the rule; youth access restrictions and prohibitions on free samples, which can be expected to constrain youth access to tobacco products and curb rising uptake; health warning statements, which will help consumers understand and appreciate the risks of using tobacco products; prohibitions against false or misleading claims and unsubstantiated modified risk claims; and other changes [such as monitoring and ingredient listings].'' *Nicopure Labs, LLC* v. *FDA,* 266 F. Supp. 3d 360, 403–404 (D.D.C. 2017), *aff'd,* 944 F.3d 267 (D.C. Cir. 2019). Plaintiffs challenging the rule claimed that because the FDA had not quantified the benefits of the rule, it ''cannot realistically determine that a rule's benefits justify its costs,'' because ''it does not have . . . a general grasp of the rule's benefits.'' *Id.* at 406. The court disagreed, finding the agency's statement of benefits to have ''provided substantial detail on the benefits of the rule, and the reasons why quantification was not possible'' and in any case agreeing with the agency that there was no obligation to quantify benefits in any particular way. *Id.*

We think the inquiry posed to the EPA by CAA section 112(n)(1)(A) resembles those posed to the agencies in these decisions, in which agencies tasked with protecting and serving the

[57] Unquantified effects include, but are not limited to, additional neurodevelopmental and cardiovascular effects from exposure to methylmercury, degraded ecosystem services resulting from methylmercury, and additional health risks from exposure to non-mercury HAP. Further, these effects can be unequally distributed with more highly-exposed populations (*e.g.,* subsistence fishers) experiencing disproportionally high risks.

public elected to take actions that would impose significant costs in order to achieve important benefits that could not be precisely quantified or were in some cases uncertain—protection from terrorist attacks, speeding the advancement of digital technology, and subjecting a new product to marketing and safety regulation. In those cases, the framework for decision-making was to make a judgment after a weighing of advantages against disadvantages, considering qualitative factors as well as quantified metrics. Here, we employ a similar totality-of-the-circumstances approach to the CAA section 112(n)(1)(A) inquiry as to whether it is appropriate to regulate HAP emissions from EGUs.

1. Consideration of Advantages Under the Administrator's Preferred Approach

Earlier sections of this preamble (sections III.A and III.B) discuss in detail the EPA's evaluation of the public health and environmental advantages of regulating HAP from U.S. EGUs and the reasons it is not possible to quantify or monetize most of those advantages, as well as the EPA's comprehensive assessment of the costs of doing so. We will not in this section repeat every detail and data point, but we incorporate all of that analysis here and highlight only a few of the considerations that weighed heavily in our application of the preferred totality-of-the-circumstances approach.

Under our preferred approach, we first consider the public health advantages to reducing HAP from EGUs, and the other factors Congress identified as focuses for study in CAA section 112(n)(1). As noted, we give particular weight in our determination to the information related to the statutory factors identified for the EPA's consideration by the studies—namely, the hazards to public health reasonably anticipated to occur as a result of EGU HAP emissions (112(n)(1)(A)), the rate and mass of mercury emissions from EGUs (112(n)(1)(B)), the health and environmental effects of such emissions (112(n)(1)(B)), and the levels of mercury exposure below which adverse human health effects are not expected to occur as well as the mercury concentrations in the tissue of fish which may be consumed (including by sensitive populations) without adverse effects to public health (112(n)(1)(C)).

The statutorily mandated studies are the foundation for the EPA's finding that HAP emissions from U.S. EGUs represent a clear hazard to public health and the environment, and as documented in section III.A., the EPA has continued to amass an extensive body of evidence related to the original study topics that only strengthens the conclusions drawn in the earlier studies. As discussed in section III.A, the EPA completed a national-scale risk assessment focused on mercury emissions from U.S. EGUs as part of the 2011 Final Mercury TSD. That assessment specifically examined risk associated with mercury released from U.S. EGUs that deposits to watersheds within the continental U.S., bioaccumulates in fish as methylmercury, and is consumed when fish are eaten by female subsistence fishers of child-bearing age and other freshwater self-caught fish consumers. We focused on the female subsistence fisher subpopulation, which includes females of a child-bearing age who reside with a subsistence fisher, because there is increased risk for *in utero* exposure and adverse outcomes in children born to female subsistence fishers with elevated exposure to methylmercury.[58] Our analysis of the watersheds studied would lead to exposures exceeding the methylmercury RfD for this population, based on *in utero* effects, due in part to the contribution of domestic EGU emissions of mercury. We also found that deposition of mercury emissions from U.S. EGUs alone led to potential exposures that exceed the RfD in up to 10 percent of modeled watersheds.

We have also examined impacts of prenatal methylmercury exposure on unborn children of recreational anglers consuming self-caught fish from inland freshwater lakes, streams, and rivers, and found significant IQ loss in the affected population of children. Our analysis, which we recognized did not cover consumption of recreationally caught seafood from estuaries, coastal waters, and the deep ocean, nevertheless indicated significant health harm from methylmercury exposure. Methylmercury exposure also leads to adverse neurodevelopmental effects such as performance on neurobehavioral tests, particularly on tests of attention, fine motor function, language, and visual spatial ability. See section III.A.2.a in the 2022 Proposal.

The population that has been of greatest concern with respect to methylmercury exposure is women of childbearing age because developing fetuses are especially vulnerable to the effects of methylmercury compared to other life stages. See 85 FR 24995 (May 3, 2011). In the Mercury Study, the EPA estimated that, at the time of the study, 7 percent of women of childbearing age in the continental U.S. (or about 4 million women) were exposed to methylmercury at levels that exceeded the RfD and that about 1 percent of women of childbearing age (or about 580,000 women) had methylmercury exposures three to four times the RfD. See 65 FR 79827 (December 20, 2000). We also performed a new bounding analysis for this action that focuses on the potential for IQ points lost in children exposed *in utero* through maternal fish consumption by the population of general U.S. fish consumers (see section III.A.3.d in the 2022 Proposal).

Another important human health impact documented by the EPA over the last 2 decades includes cardiovascular impacts of exposure to methylmercury—including altered blood-pressure and heart-rate variability in children as a result of fetal exposure and higher risk of acute MI, coronary heart disease, and cardiovascular heart disease in adults, due to dietary exposure. Studies that have become available more recently led the EPA to perform new quantitative screening analyses (as described in section III.A.3 in the 2022 Proposal) to estimate the incidence of MI (heart attack) mortality that may be linked to U.S. EGU mercury emissions (specifically, the counterfactual scenario of EGU emissions in 2016 without MATS). The new analyses performed include an extension of the 2011 watershed-level subsistence fisher methylmercury risk assessment to evaluate the potential for elevated MI-mortality risk among subsistence fishers (see section III.A.3.b in the 2022 Proposal; 2021 Risk TSD) and a separate risk assessment examining elevated MI mortality among all adults that explores potential risks associated with exposure of the general U.S. population to methylmercury from domestic EGUs through commercially-sourced fish consumption (see section III.A.3.c in the 2022 Proposal; 2021 Risk TSD). The updated subsistence fisher analysis estimated that up to 10 percent of modeled watersheds are associated with exposures linked to increased risk of MI mortality, but for some populations such as low-income Black subsistence fishers active in the Southeast, that number is approximately 25 percent of the watersheds modeled. The bounding analysis results estimating MI-mortality attributable to U.S. EGU-sourced mercury for the general U.S. population range from 5 to 91 excess deaths annually. As noted, we give significant weight to these findings

[58] The NAS Study had also highlighted this population as one of particular concern due to the regular and frequent consumption of relatively large quantities of fish. See 65 FR 79830 (December 20, 2000).

and analyses examining public health impacts associated with methylmercury, given the statutory focus in CAA section 112(n)(1)(B) and 112(n)(1)(C) on adverse effects to public health from EGU mercury emissions and the directive to develop an RfD (''threshold level of mercury exposure below which adverse human health effects are not expected to occur''), and in particular one that is designed to assess ''mercury concentrations in the tissue of fish which may be consumed (including consumption by sensitive populations).'' See CAA section 112(n)(1)(C).

Because of CAA section 112(n)(1)(A)'s broader focus on hazards to public health from all HAP, not just mercury, we also give considerable weight to health effects associated with non-mercury HAP exposure (*e.g.,* arsenic, HF, HCl, selenium, chromium, cobalt, nickel, hydrogen cyanide, beryllium, and cadmium; see section III.A.2.b in the 2022 Proposal for further detail), including chronic health disorders such as irritation of the lung, skin, and mucus membranes; decreased pulmonary function, pneumonia, or lung damage; detrimental effects on the central nervous system; damage to the kidneys; and alimentary effects such as nausea and vomiting). The 2011 Non-Hg HAP Assessment, performed as part of the EPA's 2012 reaffirmation of the appropriate and necessary determination, expanded on the original CAA section 112(n)(1)(A) Utility Study by examining further public health hazards reasonably anticipated to occur from EGU HAP emissions after imposition of other CAA requirements. This study included a refined chronic inhalation risk assessment that was designed to assess how many coal- and oil-fired EGUs had cancer and non-cancer risks associated with them, and indicated that absent regulation, a number of EGUs posed cancer risks to exposed populations (see section III.A.2.b in the 2022 Proposal).

As discussed in section II.B, the statutory design of CAA section 112 quickly secured dramatic reductions in the volume of HAP emissions from stationary sources. CAA section 112(n)(1)(B) also directs the EPA to study, in the context of the Mercury Study, the ''rate and mass'' of mercury emissions. We therefore think it is reasonable to consider, in assessing the advantages to regulating HAP emissions from EGUs, the volume of emissions from that sector prior to regulation—as an absolute number and relative to other sources—and the expected volume of emissions with CAA section 112(d) standards in place. Prior to the EPA's promulgation of MATS in 2012, the EPA estimated that in 2016, without MATS, coal-fired U.S. EGUs above 25 MW would emit 29 tons of mercury per year. While these mercury emissions from U.S. EGUs represented a decrease from 1990 and 2005 levels (46 tons and 53 tons, respectively), they still represented nearly half of all domestic anthropogenic mercury emissions in 2011 (29 out of 64 tons total). Considered on a proportional basis, the relative contribution of U.S. EGUs to all domestic anthropogenic mercury emissions was also stark. The EGU sector emitted more than six times as much mercury as any other sector (the next highest being 4.6 tons). See Table 3 at 76 FR 25002 (May 3, 2011). Prior to MATS, U.S. EGUs were estimated to emit the majority of HCl and HF nationally and were the predominant source of emissions nationally for many metal HAP as well, including antimony, arsenic, chromium, cobalt, and selenium. *Id.* at 25005–06.

In 2012, the EPA projected that MATS would result in an 88 percent reduction in HCl emissions, a 75 percent reduction in mercury emissions, and a 19 percent reduction in PM emissions (a surrogate for non-mercury metal HAP) [59] from coal-fired units greater than 25 MW in 2015 alone. See 77 FR 9424 (February 16, 2012). In fact, actual emission reductions since MATS implementation have been even more substantial. In 2017, by which point all sources were required to have complied with MATS, the EPA estimated that acid gas HAP emissions from EGUs had been reduced by 96 percent, mercury emissions had been reduced by 86 percent, and non-mercury metal HAP emissions had been reduced by 81 percent compared to 2010 levels. See 84 FR 2689 (February 7, 2019). Retaining the substantial reductions in the volume of toxic pollution entering our air, water, and land, from this large fleet of domestic sources reduces the substantial risk associated with this pollution faced by exposed populations.

Since the EPA first estimated the costs and benefits of MATS in 2011, EGU HAP emissions have decreased significantly due to several factors, including the installation of more affordable and more effective HAP emission controls installed to comply with the EPA's standards and changes in market conditions. All of these factors (control cost and effectiveness, fuel switching) are included in the EPA's sector-wide costs assessment discussed in section III.B. At bottom, and as often happens with environmental standards, the sector achieved the standard and reduced HAP emissions at lower cost than the EPA had projected. In the original 2011 RIA, the EPA estimated monetized benefits using well-established and scientifically supported methods that prevailed when the rule was promulgated. Were the EPA to re-estimate these benefits today, using methods consistent with the current state of the science and accounting for updated emissions changes that reflect both MATS implementation decisions and the effects of market forces, our best professional judgment is that the total monetized benefits would still substantially exceed the costs after an *ex-post* consideration.

Even though reducing HAP from EGUs would benefit everyone in the U.S. by reducing risk and hazards associated with toxic air pollution, it is worth noting that the impacts of EGU HAP emissions in the U.S. have not been borne equally nationwide. Certain communities and individuals have historically borne greater risk from exposure to HAP emissions from EGUs prior to MATS, as demonstrated by the EPA's risk analyses. The individuals and communities that have been most impacted have shouldered a disproportionate burden for the energy produced by the power sector, while the energy produced benefits everyone. In other words, these communities are subject to a greater share of the externalities of HAP emissions generated by EGUs producing power for everyone. A clear example of these disproportionately impacted populations are subsistence fishers who experience increased health risks due to U.S. EGU mercury deposition at the watersheds where they are active (2011 Final Mercury TSD). CAA section 112(n)(1)(C) directed the NIEHS to examine risks to public health experienced by sensitive populations as a result of the consumption of mercury concentrations in fish tissue, which we think includes fetuses and communities that are reliant on local fish for their survival, and CAA section 112 more generally is drafted in order to be protective of small cohorts of highly exposed and susceptible populations. As discussed above in section II.B.2, the statutory design and direction repeatedly emphasize that the EPA should regulate with the most exposed and most sensitive members of the population in mind in order to achieve an acceptable level of HAP emissions with an ample margin of safety. We

[59] See the 2012 MATS Final Rule for a discussion of the use of filterable PM as a surrogate for non-mercury metal HAP (77 FR 9402; February 16, 2012).

therefore give significant weight to the importance of reducing risks to particularly impacted populations, including those who consume large amounts of self-caught fish reflecting cultural practice and/or economic necessity, including tribal populations, specific ethnic communities and low-income populations including Black persons living in the southeastern U.S.

Consistent with CAA section 112(n)(1)(B) and the general goal of CAA section 112 to reduce risks posed by HAP to the environment, we also consider the ecological effects of methylmercury and acid gas HAP (see section III.A.2.c in the 2022 Proposal). Scientific studies have consistently found evidence of adverse impacts of methylmercury on fish-eating birds and mammals, and insect-eating birds. These harmful effects can include slower growth and development, reduced reproduction, and premature mortality. Adverse environmental impacts of emissions of acid gas HAP, in particular HCl, include acidification of terrestrial and aquatic ecosystems. In the EPA's recent ''Integrated Science Assessment for Oxides of Nitrogen, Oxides of Sulfur and Particulate Matter—Ecological Criteria'' (2020), we concluded that the body of evidence is sufficient to infer a causal relationship between acidifying deposition and adverse changes in freshwater biota like plankton, invertebrates, fish, and other organisms. Adverse effects on those animals can include physiological impairment, loss of species, changes in community composition, and biodiversity. Because EGUs contribute to mercury deposition in the U.S., we conclude that EGUs are contributing to the identified adverse environmental effects, and consider the beneficial impacts of mitigating those effects by regulating EGUs.

2. Consideration of Disadvantages Under the Administrator's Preferred Approach

We turn next in our application of the preferred approach to the consideration of the disadvantages of the MATS regulation, which in this case we measure primarily in terms of the costs of the regulation. As discussed in section III.B, for purposes of this preferred totality-of-the-circumstances approach, we start with the sector-level estimate developed in the 2011 RIA. Given the complex, interconnected nature of the power sector, we think it is appropriate to consider this estimate, which represents the incremental costs to the entire power sector to generate electricity, not just the compliance costs projected to be borne by regulated EGUs. We explain in section III.B that while a precise *ex post* estimate of this sector-level figure is not possible, we update those aspects of the cost estimate where we can credibly do so (see section III.B.2), and our consideration of the cost of regulation therefore takes into account the fact that new analyses performed as part of this action demonstrate that the 2011 RIA cost estimate was likely significantly overestimated. We conclude that regulation is appropriate and necessary under either cost estimate—the original cost estimate in the 2011 RIA or our updated cost estimate that concludes that actual costs were likely significantly lower.

As with the benefits side of the ledger, where we look comprehensively at the effects of reducing the volume of HAP, we also comprehensively assess costs in an attempt to evaluate the economic impacts of the regulation as a whole. We situate the cost of the regulation in the context of the economics of power generation, as we did in 2016, because we think examining the costs of the rule relative to three sector-wide metrics provides a useful way to evaluate the disadvantages of expending these compliance costs to this sector beyond a single monetary value. For each of these metrics, we use our 2011 estimate of annual compliance costs, which, as is discussed in section III.B.2 and the Cost TSD, was likely to have been significantly overestimated by billions of dollars. We first evaluate the 2011 projected annual compliance costs of MATS as a percent of annual power sector sales, also known as a ''sales test.'' A sales test is a frequently used indicator of potential impacts from compliance costs on regulated industries, and the EPA's analysis showed that projected 2015 compliance costs, based on the 2011 estimate, represented between 2.7–3.5 percent of power sector revenues from historical annual retail electricity sales. See section III.B.3; Cost TSD; 80 FR 75033 (December 1, 2015). We also examine the annual capital expenditures that were expected for MATS compliance as compared to the power sector's historical annual capital expenditures. We conclude that projected incremental annual capital expenditures of MATS would be a small percentage of 2011 power sector-level capital expenditures, and well within the range of historical year-to-year variability on industry capital expenditures. *Id.* Finally, we consider the annual operating or production expenses in addition to capital expenditures because we were encouraged by commenters during the 2016 rulemaking to use this broader metric of power industry costs to provide perspective on the cost of MATS relative to total capital and operational expenditures by the industry historically. Consistent with our other findings, we conclude that, even when using the likely overestimated cost of MATS based on the 2011 RIA, the total capital and operational expenditures required by MATS are in the range of about 5 percent of total historical capital and operational expenditures by the power sector during the period of 2000–2011. See section III.B.3 in the 2022 Proposal; Cost TSD; 81 FR 24425 (April 25, 2016). In this action, we re-analyze all of these metrics using updated data to reflect more recent information (as of 2019), and take into consideration the fact that the 2011 RIA cost estimate was likely significantly overestimated. All of this new analysis further supports our findings as to the cost of MATS relative to other power sector economics based on the record available to the EPA at the time we were making the threshold determination (*i.e.,* the 2012 record).

Consistent with the *Michigan* Court's instruction to consider all advantages and disadvantages of regulation, we also assess, as we did in 2016, disadvantages to regulation that would flow to the greater public. Specifically, in weighing the disadvantages in our analysis of whether regulation is ''appropriate,'' we examine whether regulation of EGUs would adversely impact the provision of reliable, affordable electricity, because had regulation been anticipated to have such an effect, it would have weighed heavily on our decision as to whether it was appropriate to require such regulation. The CAA tasks the EPA ''to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population.'' CAA section 101(b)(1). As noted, we also think examining these potential impacts is consistent with the ''broad and all-encompassing'' nature of the term ''appropriate,'' as characterized by the Supreme Court. *Michigan,* 576 U.S. at 752. We are particularly interested in examining the expected impact of MATS implementation on the retail price of electricity, because in electricity markets, utility expenditures can be fully or partially passed to consumers. It was therefore reasonable to assume that the cost of MATS could result in increased retail electricity prices for consumers, although we emphasize, as we did in 2016, that the electricity price impacts examined under this metric do not reflect *additional* compliance costs

on top of the estimate produced in the 2011 RIA but rather reflect the passing on of a share of those costs to consumers (and ultimately reducing the costs EGU owners would otherwise bear). However, even though the impacts on electricity prices are reflected in the total cost estimate to the sector as a whole, we think, for the reasons stated above, that electricity price impacts are worthy of attention because of the potential effect on the public.

We therefore estimate the percent increase in retail electricity prices projected to result from MATS compared to historical levels of variation in electricity prices. See section III.B.3 in the 2022 Proposal; 80 FR 75035 (December 1, 2015). We estimate that retail electricity prices for 2015 would increase by about 0.3 cents per kilowatt-hour, or 3.1 percent with MATS in place. Between 2000 and 2011, the largest annual year-to-year decrease in retail electricity price was −0.2 cents per kilowatt-hour and the largest year-to-year increase during that period was +0.5 cents per kilowatt-hour. The projected 0.3 cents increase due to MATS was therefore well within normal historical fluctuations. *Id.* As with the other metrics examined, as the increase in retail electricity prices due to MATS was within the normal range of historical variability, a substantially lower estimate for impacts on electricity prices would only further support the EPA's determination. We also note that the year-to-year retail electricity price changes in the new information we examined (*i.e.,* years 2011–2019) were within the same ranges observed during the 2000–2011 period, and that in fact, during that period when MATS was implemented, retail electricity prices have generally decreased (9.3 cents per kilowatt-hour in 2011 to 8.7 cents per kilowatt-hour in 2019). See section III.B.3 in the 2022 Proposal. Consistent with these observed trends in retail electricity prices, as discussed in section III.B.2 and further below, our *ex post* analysis of MATS indicates that the projected compliance costs in the 2011 RIA—and, as a corollary, the projected increases in retail electricity prices—were likely significantly overestimated. Certainly, we have observed nothing in the data that suggests the regulation of HAP from EGUs resulted in increases in retail electricity prices that would warrant substantial concern in our weighing of this factor.

Similar to our reasoning for examining impacts on electricity prices for consumers, in assessing the potential disadvantages to regulation, we elected to also look at whether the power sector would be able to continue to provide reliable electricity after the imposition of MATS. We think this examination naturally fits into our assessment of whether regulation is ''appropriate,'' because had MATS interfered with the provision of reliable electricity to the public, that would be a significant disadvantage to regulation to weigh in our analysis. In examining this factor, we looked at both resource adequacy and reliability—that is, the provision of generating resources to meet projected load and the maintenance of adequate reserve requirements for each region (resource adequacy) and the sector's ability to deliver the resources to the projected electricity loads so that the overall power grid remains stable (reliability). See section III.B.3 in the 2022 Proposal; U.S. EPA 2011, Resource Adequacy and Reliability TSD; 80 FR 75036 (December 1, 2015). Our analysis indicated that the power sector would have adequate and reliable generating capacity, while maintaining reserve margins over a 3-year MATS compliance period. *Id.* We did not in this action update the Resource Adequacy and Reliability Study conducted in 2011, but we note that the EPA, as a primary regulator of EGUs, is keenly aware of adequacy and reliability concerns in the power sector and in particular the relationship of those concerns to environmental regulation. We have seen no evidence in the last decade to suggest that the implementation of MATS caused power sector adequacy and reliability problems, and only a handful of sources obtained administrative orders under the enforcement policy issued with MATS to provide relief to reliability critical units that could not comply with the rule by 2016.

In addition to the cost analyses described above, the EPA revisited its prior records examining the costs of mercury controls consistent with the requirement in CAA section 112(n)(1)(B), the cost of controls for other HAP emissions from EGUs, and the cost of implementing the utility-specific ARP, which Congress wrote into the 1990 CAA Amendments and implementation of which Congress anticipated could result in reductions in HAP emissions. 80 FR 75036–37 (December 1, 2015). The ARP, like MATS, was expected to have a significant financial impact on the power sector, with projections of its cost between $6 billion to $9 billion per year (in 2000 dollars), based on the expectation that many utilities would elect to install scrubbers in order to comply with the ARP. *Id.* at 75037. The actual costs of compliance were much less (up to 70 percent lower than initial estimates), in large part because of the choice by many utilities and power providers to comply with the ARP by switching to low sulfur coal instead of installing scrubbers.[60] This choice also resulted in far fewer reductions in HAP emissions than would have occurred if more EGUs had installed scrubbers.

With respect to the costs of technology for control of mercury and non-mercury HAP, the record evidence shows that in 2012 controls were available and routinely used and that control costs had declined considerably over time. *Id.* at 75037–38. We also note that, as explained at length in section III.B.2 of the 2022 Proposal, the actual compliance costs of MATS, with respect to capital and operating expenditures associated with installing and operating controls, were likely billions of dollars lower than what we projected at the time of the rule. In addition, the newer information examined as part of this action demonstrates that actual control costs were much lower than we projected, which weighs further in favor of a conclusion that it is appropriate to impose those costs in order to garner the advantages of regulation.

3. Conclusions Regarding the Comparison of Advantages and Disadvantages Under the Administrator's Preferred Approach

Our review of the record and application of the preferred totality-of-the-circumstances approach has demonstrated that we have, over the last 2 decades, amassed a voluminous and scientifically rigorous body of evidence documenting the significant hazards to public health associated with HAP emissions from EGUs, particularly to certain vulnerable populations that bear greater risk from these emissions than the general public. We have looked at the volume of emissions coming from these sources and what the impact of regulation would be on that volume. We examined the cost of regulation to industry (even using an estimate of cost that we know to be higher than what was expended), and the potential adverse impacts that could be felt by the public via increased electricity prices and access to reliable electricity. And, consistent with the statute, we have also considered adverse impacts of EGU pollution on the environment as well as availability of controls and the costs of those controls.

[60] U.S. EPA Clean Air Markets Div., 2011, *National Acid Precipitation Assessment Program Report to Congress 2011: An Integrated Assessment,* National Science and Technology Council, Washington, DC.

Even based solely on the record available to us at the time we issued the regulation and made the threshold determination in 2012, we find that the benefits of regulation are manifold to the population at large, and they address serious risks to vulnerable populations that remained after the implementation of the ARP and other controls imposed upon the power sector that were required under the CAA. We have placed considerable weight on these benefits, given the statutory directive to do so in CAA section 112(n)(1)(A) and Congress' clear purpose in amending CAA section 112 in 1990. In contrast, the costs, while large in absolute terms, were shown in our analyses to be within the range of other expenditures and commensurate with revenues generated by the sector, and our analysis demonstrated that these expenditures would not—and did not—have any significant impacts on electricity prices or reliability. After considering and weighing all of these facts and circumstances, in an exercise of his discretion under the Act, the Administrator concludes that the substantial benefits of reducing HAP from EGUs, which accrue in particular to the most vulnerable members of society, are worth the costs. Consequently, we find after weighing the totality of the circumstances, that regulation of HAP from EGUs is appropriate after considering cost.

The newer information examined as part of this action regarding both benefits and costs provides additional support for these conclusions. The robust and long-standing scientific foundation regarding the adverse health and environmental risks from mercury and other HAP is fundamentally unchanged since the comprehensive studies that Congress mandated in the CAA were completed decades ago. But in this action, we completed screening level risk assessments, informed by newer meta-analyses of the dose-response relationship between methylmercury and cardiovascular disease, which indicate that a segment of the U.S. population was at increased risk of prematurely dying by heart attack due to methylmercury exposure with ~90 (possibly more) being attributable to mercury emissions from EGUs.[61] Further, analyses show that some populations (*e.g.,* low-income Blacks in the Southeast and certain tribal communities engaging in subsistence fishing activity) likely bear a disproportionately higher risk from EGU HAP emissions than the general populace.

The new cost information analyzed by the EPA, discussed in section III.B, indicates that the cost projection used in the 2016 Supplemental Finding (*i.e.,* the 2011 RIA cost estimate) likely significantly overestimated the actual costs of compliance of MATS. Specifically, the EGU sector installed far fewer controls to comply with the HAP emissions standards than projected; certain modeling assumptions, if updated with newer information, would have resulted in a lower cost estimate; unexpected advancements in technology occurred; and the country experienced a dramatic increase in the availability of comparatively inexpensive natural gas. All of these factors likely resulted in a lower actual cost of compliance than the EPA's projected estimates in 2011. We therefore find that when we consider information available to the EPA after implementation of the rule, our conclusion that it was appropriate to regulate this sector for HAP is further strengthened. The annual compliance costs projected in the 2011 RIA were likely overestimated by an amount in the billions of dollars.

We note as well that in comments on the 2022 Proposal and during prior rulemaking processes related to the appropriate and necessary determination, stakeholders suggested that undermining the threshold finding in order to pave the way to rescinding MATS would have grave economic and health consequences. Utilities reported that they rely upon the mandated status of MATS in order to recoup expenditures already made to comply with the rule before Public Utility Commission proceedings.[62] States asserted that they rely upon the Federal protections achieved by the rule in state implementation planning and other regulatory efforts.[63] We note this point also implies that the expenditures on MATS compliance reduce costs associated with meeting other regulatory requirements so, broadly speaking, the net cost impacts of MATS are reduced in locations where MATS emissions reductions contribute to meeting air quality goals that are not sector-specific, such as the National Ambient Air Quality Standards (NAAQS). And other industries, such as pollution control companies, have made business decisions based on the existence of MATS.[64] We think these reliance interests, nearly all of which are aligned, also weigh in favor of retaining the affirmative appropriate and necessary determination.

Finally, while we focus on the benefits from reducing HAP, we note that the *Michigan* court directed that ''any disadvantage could be termed a cost.'' *Michigan,* at 752. The corollary is that any advantage could be termed a benefit. And so, while it is not necessary to our conclusion that regulation is appropriate—a conclusion that would be the same even without any additional benefits—we also consider, under our totality-of-the-circumstances approach, whether there are additional advantages or disadvantages to the specific controls imposed under MATS. Specifically, we note that because the controls required to reduce HAP from U.S. EGUs resulted in substantial reductions in co-emitted pollutants, including direct $PM_{2.5}$ as well as SO_2 and NO_X, which are both precursors to ozone and fine particle formation, the Administrator's conclusion is further supported by the ramifications of the regulatory requirements in MATS for these pollutants. We find that the benefits associated with such reductions are appropriate to consider within the totality-of-the-circumstances approach we apply to making the CAA section 112(n)(1)(A) determination. Therefore, while we conclude that the HAP-reduction benefits associated with regulating HAP alone outweigh the costs without consideration of non-HAP-reduction benefits, we also find that, to the extent we consider benefits attributable to reductions in co-emitted pollutants as a concomitant advantage,

[61] This estimate of premature mortality is for the EGU sector after imposition of the ARP and other CAA requirements, but before MATS implementation.

[62] See, *e.g.,* Comment Letter from Edison Electric Institute, Docket ID Item No. EPA–HQ–OAR–2018–0794–2267; Comment Letter from Edison Electric Institute, National Rural Electric Cooperative Association (NRECA), American Public Power Association, The Clean Energy Group, Class of '85 Regulatory Response Group, Large Public Power Council, Global Energy Institute, International Brotherhood of Electrical Workers, International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers & Helpers, and the Laborers' International Union of North America, Docket ID Item No. EPA–HQ–OAR–2018–0794–0577.

[63] See, *e.g.,* Comment Letter from Attorneys General of Massachusetts, California, Connecticut, Delaware, Illinois, Iowa, Maine, Maryland, Michigan, Minnesota, Nevada, New Jersey, New Mexico, New York, North Carolina, Oregon, Rhode Island, Vermont, Virginia, Washington, and the District of Columbia, the Maryland Department of the Environment, the City Solicitor of Baltimore, the Corporation Counsels of Chicago and New York City, the County Attorney of the County of Erie, NY, and the County Counsel for the County of Santa Clara, CA, Docket ID Item No. EPA–HQ–OAR–2018–0794–1175.

[64] See, *e.g.,* Comment Letter from ADA Carbon Solutions, LLC, Docket ID Item No. EPA–HQ–OAR–2018–0794–0794; Comment Letter from Advanced Emissions Solutions, Inc., Docket ID Item No. EPA–HQ–OAR–2018–0794–1181; Comment Letter from Exelon Corporation, Docket ID Item No. EPA–HQ–OAR–2018–0794–1158.

these benefits provide even more support for our conclusion that regulation is appropriate under a totality-of-the-circumstances approach. Specifically, we note that reductions in co-emissions of direct $PM_{2.5}$, SO_2, and NO_X will have substantial health benefits in the form of decreased risk of premature mortality among adults, and reduced incidence of lung cancer, new onset asthma, exacerbated asthma, and other respiratory and cardiovascular diseases. In the 2011 RIA, the EPA estimated the number and value of avoided $PM_{2.5}$-related impacts, including 4,200 to 11,000 premature deaths, 4,700 nonfatal heart attacks, 2,600 hospitalizations for respiratory and cardiovascular diseases, 540,000 lost work days, and 3.2 million days when adults restrict normal activities because of respiratory symptoms exacerbated by $PM_{2.5}$. We also estimated substantial additional health improvements for children from reductions in upper and lower respiratory illnesses, acute bronchitis, and asthma attacks. In addition, we estimated the benefit of reductions in CO_2 emissions under MATS. Although the EPA only partially monetized the benefits associated with these reductions in multiple co-emitted pollutants in the 2011 RIA, the EPA estimated that—due in particular to the strong causal relationship between $PM_{2.5}$ and premature mortality—these reductions could result in as much as $90 billion (in 2016 dollars) in additional public health benefits annually. Therefore, if these non-HAP benefits are considered in the totality-of-the-circumstances approach, we take note of the fact that regulating EGUs for HAP emissions results in substantial other health and environmental benefits by virtue of also reducing non-HAP emissions from EGUs.

Having weighed all of the advantages and disadvantages of EGU HAP regulation, the Administrator concludes, under the preferred totality-of-the-circumstances approach, that regulation is ''appropriate'' whether examining the 2012 record or the updated record and whether considering the benefits conferred by reducing EGU HAP alone or considering the additional benefits to reducing other pollutants from EGUs.

E. The Administrator's Benefit-Cost Analysis Approach and Conclusion

In addition to the preferred approach, we separately put forward an alternative approach in the 2022 Proposal, as we did in 2016, to support a determination that it is appropriate and necessary to regulate HAP from EGUs through the application of a formal BCA. The formal BCA we conducted for purposes of meeting Executive Order 12866, using established BCA practices, also demonstrates that the benefits estimated for MATS far exceed the estimated costs as reported in the 2011 RIA.[65] As explained further below, the EPA used the 2011 RIA as the basis for its formal BCA because it provides the most empirically tractable *ex ante* analysis of potential impacts of the MATS regulation.[66] In its net benefits projection, the 2011 RIA monetized only one benefit from regulating HAP emissions from EGUs because the EPA did not and does not have the information necessary to monetize the many other benefits associated with reducing HAP emissions from EGUs. However, the 2011 RIA properly accounted for all benefits by discussing qualitatively those that could not be quantified and/or monetized. While some of the impacts on particularly impacted populations—such as the children of recreational anglers experiencing IQ loss—were reflected in the net benefits calculation, that accounting does not really grapple with the equity-related question of whether a subset of people should continue to bear disproportionate health risks in order for others to avoid the increased cost of controlling HAP from EGUs. We continue to prefer a totality-of-the-circumstances approach to making the determination under CAA section 112(n)(1)(A), but we think that if a formal BCA is to be used, it should, consistent with economic theory and principles, account for all costs and all benefits.

BCA has been part of executive branch rulemaking for decades. Over the last 50 years, Presidents have issued Executive orders directing agencies to conduct these analyses as part of the rulemaking development process. Executive Order 12866, currently in effect, requires a quantification of benefits and costs to the extent feasible for any regulatory action that is likely to result in a rule that may have an annual effect on the economy of $100 million or more or adversely affect in a material way certain facets of society. Executive Order 12866, at section 3(f)(1).

The EPA performed a formal BCA to comport with Executive Order 12866 as part of the 2012 MATS rulemaking process (referred to herein as the 2011 RIA). In the 2016 Supplemental Finding, the EPA relied on the BCA it had performed for Executive Order 12866 purposes as an alternative basis upon which to make the appropriate and necessary determination. That BCA, which reflected in its net benefits calculation only certain categories of benefits that could be confidently monetized, estimated that the final MATS would yield annual *net* monetized benefits (in 2007 dollars) of between $37 billion to $90 billion using a 3-percent discount rate and $33 billion to $81 billion using a 7-percent discount rate. See 80 FR 75040 (December 1, 2015). These estimates included the portion of the HAP benefits described in section III.A that could be monetized at the time, along with additional health benefits associated with the controls necessary to control the HAP emissions from U.S. EGUs. Specifically, as noted, the net benefits estimates included only one of the many HAP benefits associated with reduction of HAP. Nonetheless, the monetized benefits of MATS outweighed the $9.6 billion in estimated annual monetized costs by between 3-to-1 and 9-to-1 depending on the benefit estimate and discount rate used. The implementation of control technologies to reduce HAP emissions from EGU sources also led to reductions in emissions of SO_2, direct $PM_{2.5}$, as well as other precursors to $PM_{2.5}$ and ozone. In the 2011 RIA, the EPA did not quantify the benefits associated with ozone reductions resulting from the emissions controls under MATS, but we did include estimates of the projected benefits associated with reductions in $PM_{2.5}$. These benefits were quite substantial and had a large economic

[65] As explained above, see footnote 30, we use the term ''formal benefit-cost analysis'' to refer to an economic analysis that attempts to the extent practicable to quantify all significant consequences of an action in monetary terms in order to determine whether an action increases economic efficiency. When there are technical limitations that prevent certain benefits or costs that may be of significant magnitude from being quantified or monetized, then information is provided describing those potentially important non-monetized benefits or costs. This usage is consistent with the definition of a benefit-cost analysis used in the economics literature and the EPA's Guidelines for Preparing Economic Analyses. Note that regulatory impact analyses more broadly can give appropriate attention to both unquantified and distributional effects, as OMB's Circular A–4 recommends.

[66] The 2011 RIA reports the best forecast of the benefits, costs and impacts available to the EPA when MATS was promulgated. Furthermore, while the EPA concludes that the monetized costs in the 2011 RIA were likely significantly overestimated, as described in the proposal, the EPA could not estimate *ex post* costs using a technical approach that would be commensurable to the approach taken for the 2011 formal BCA cost projections, in part due to the complex and interconnected nature of the power sector. Therefore, we cannot directly adjust the cost estimate reported in the 2011 formal BCA for this likely overestimate. However, a suite of quantitative and qualitative evaluations indicating that the projected costs in the 2011 RIA were almost certainly significantly overestimated, as well as the potential scope of additional reduced risks such as premature deaths from heart attacks associated with domestic EGU mercury emissions, directionally supports the net benefits calculation reported in the 2011 RIA.

value. We also included in our monetized benefits estimates the effects from the reduction in CO_2 emissions projected to result from the rule.

BCAs are a useful tool to ''estimate the *total* costs and benefits to society of an activity or program,'' and ''can be thought of as an accounting framework of the overall social welfare of a program.'' EPA Guidelines for Preparing Economic Analyses, Appendix A, A–6 (emphasis in original). In a BCA, ''[t]he favorable effects of a regulation are the benefits, and the foregone opportunities or losses in utility are the costs. Subtracting the total costs from the total monetized benefits provides an estimate of the regulation's net benefits to society.'' *Id.* Importantly, however, ''[t]he key to performing BCA lies in the ability to measure both benefits and costs in monetary terms so that they are comparable.'' *Id.;* see also OMB Circular A–4 (''A distinctive feature of BCA is that both benefits and costs are expressed as monetary units, which allows you to evaluate different regulatory options with a variety of attributes using a common measure.'').[67]

In the 2020 Final Action, the EPA rescinded the 2016 alternative approach on the basis that it was ''fundamentally flawed'' because it applied ''a formal cost-benefit analysis'' to the CAA section 112(n)(1)(A) determination. 85 FR 31299 (May 22, 2020). The EPA's objection at the time to the use of ''a formal cost-benefit analysis'' in the context of this determination was that doing so ''implied that an equal weight was given to the non-HAP co-benefit emission reductions and the HAP-specific benefits of the regulation.'' See 85 FR 31299 (May 22, 2020). The EPA concluded that it was not appropriate to use a formal BCA in this situation because ''to give equal weight to the monetized $PM_{2.5}$ co-benefits would permit those benefits to become the driver of the regulatory determination, which the EPA believes would not be appropriate.'' *Id.* The EPA reiterated in the 2020 Final Action that ''HAP benefits, as compared to costs, must be the primary question in making the 'appropriate and necessary' determination'' and ''the massive disparity between co-benefits and HAP benefits on this record would mean that that alternative approach clearly elevated co-benefits beyond their permissible role.'' *Id.* at 31303. ''To be valid, the EPA's analytical approach to [CAA section 112(n)(1)(A)] must recognize Congress' particular concern about risks associated with HAP and the benefits that would accrue from reducing those risks.'' *Id.* at 31301.

We agree that the analytical framework for the appropriate and necessary determination should first and foremost be one that is focused on ''Congress' particular concern about risks associated with HAP and the benefits that would accrue from reducing those risks.'' *Id.* It is for this reason, as discussed in section III.C of this preamble, that we revoke the analytical framework advanced for the appropriate and necessary determination by the 2020 Final Action, as being insufficiently attentive to the public health advantages of regulation. It is also why we prefer a totality-of-the-circumstances test that allows us to weigh primarily the benefits of reductions in HAP among the many advantages of regulation. If it were unreasonable to consider beneficial impacts of emissions reductions beyond the directly regulated pollutants, then it would also be unreasonable to consider any costs other than those borne by the regulated entities. The EPA notes that it similarly accounts for positive and negative consequences such as changes in pollution emissions or concentrations in BCAs when they occur, which is consistent with economic best practices as well as executive guidance on regulatory review, and longstanding EPA practice. See, *e.g.,* 81 FR 24439–40 (April 25, 2016). If the decisional framework is going to be one that considers advantages to regulation primarily in terms of potential monetized outcomes (see 85 FR 31296–97; May 22, 2020), a formal BCA that estimates net outcomes (*i.e.,* by comparing total losses and gains) and conforms to established economic best practices and accounts for the effects of the rule that can be analyzed should be used.[68]

Consistent with scientific principles underlying BCA, both OMB Circular A–4 and the EPA's Guidelines for Preparing Economic Analyses direct the EPA to include all benefits and costs in a BCA. Per Circular A–4, OMB instructs: ''Your analysis should look beyond the direct benefits and direct costs of your rulemaking and consider any important ancillary benefits and countervailing risks. An ancillary benefit is a favorable impact of the rule that is typically unrelated or secondary to the statutory purpose of the rulemaking.'' Circular A–4 at 26. Similarly, the Guidelines state, ''An economic analysis of regulatory or policy options should present all identifiable costs and benefits that are incremental to the regulation or policy under consideration. These should include directly intended effects and associated costs, as well as ancillary (or co-) benefits and costs.'' Guidelines at 11–2. As discussed in prior MATS rulemakings (see, *e.g.,* 80 FR 75041; December 1, 2015), installing control technologies and implementing the compliance strategies necessary to reduce the HAP emissions directly regulated by the MATS rule also results in reductions in the emissions of other pollutants such as directly emitted $PM_{2.5}$ and SO_2 (a $PM_{2.5}$ precursor). A particularly cost-effective control of emissions of particulate-bound mercury and non-mercury metal HAP is through the use of PM control devices that indiscriminately collect PM along with the metal HAP, which are predominately present as particles. Similarly, emissions of the acid gas HAP are reduced by acid gas controls that are also effective at reducing emissions of SO_2 (also an acid gas, but not a HAP). *Id.* While these $PM_{2.5}$ and SO_2 emission reductions are not the objective of the MATS rule, the reductions are, in fact, a direct consequence of regulating the HAP emissions from EGUs. Specifically, controls on direct $PM_{2.5}$ emissions are required to reduce non-mercury metal HAP, while SO_2 emissions reductions

[67] Circular A–4 also encourages a thorough presentation of benefits and costs that are difficult to quantify. See *id.* at 27 (''If you are not able to quantify the effects, you should present any relevant quantitative information along with a description of the unquantified effects. . .. [P]lease include a summary table that lists all the unquantified benefits and costs, and use your professional judgment to highlight (*e.g.,* with categories or rank ordering) those that you believe are most important (*e.g.,* by considering factors such as the degree of certainty, expected magnitude, and reversibility of effects)'').

[68] In addition, CAA section 112(n)(1)(A) directs the EPA to evaluate the hazards to public health from EGU HAP emissions that are reasonably anticipated ''after imposition of the other requirements of the [CAA].'' The direction to consider the impacts of non-CAA section 112 requirements on HAP emissions from EGUs demonstrates that Congress understood that criteria pollutant controls would achieve HAP reductions. Given this understanding, it is reasonable for the EPA to consider the consequent criteria pollutant reductions attributable to CAA section 112 standards if a BCA is used to evaluate cost in the context of the appropriate finding. Furthermore, CAA section 112 legislative history not specifically directed at EGUs also supports the consideration of criteria pollutant benefits attributable to the regulation of HAP emissions. Specifically, the Senate report for the 1990 CAA amendments states: ''When establishing technology-based [MACT] standards under this subsection, the Administrator may consider the benefits which result from control of air pollutants that are not listed but the emissions of which are, nevertheless, reduced by control technologies or practices necessary to meet the prescribed limitation.'' A Legislative History of the Clean Air Act Amendments of 1990 (CAA Legislative History), Vol. 5, pp. 8512 (CAA Amendments of 1989; p. 172; Report of the Committee on Environment and Public Works S. 1630).

come from controls needed to reduce acid gas emissions from power plants.

We recognize that there are numerous possible approaches to interpret the EPA's mandate in CAA section 112(n)(1)(A). We have consistently taken the position that a formal BCA is not required under CAA section 112(n)(1)(A). See 80 FR 75039 (December 1, 2015). As set forth above, in *Michigan,* the Supreme Court declined to hold that CAA section 112(n)(1)(A) required such an assessment, stating, ''We need not and do not hold that the law unambiguously required the Agency, when making this preliminary estimate, to conduct a formal cost-benefit analysis in which each advantage and disadvantage is assigned a monetary value.'' *Michigan,* 576 U.S. at 759. Nonetheless, the EPA finds that a formal BCA provides a useful alternative approach to its preferred totality-of-the-circumstances analysis, to ''pay[ ] attention to the advantages and disadvantages'' of EGU HAP regulation, *id.* at 2707, in a rigorous and scientifically grounded way.

In the 2015 Proposal, we identified several reasons why a formal BCA was not the EPA's preferred decisional framework under CAA section 112(n)(1)(A). See 80 FR 75025 (December 1, 2015). We recognized that benefits like those associated with reduction of HAP can be difficult to monetize, and this incomplete quantitative characterization of the positive consequences can underestimate the monetary value of net benefits. See 80 FR 75039 (December 1, 2015). This is well-established in the economic literature. As noted in OMB Circular A–4, ''[w]here all benefits and costs can be expressed as monetary units, BCA provides decision makers with a clear indication of the most efficient alternative.'' Circular A–4 at 2. However, ''[w]hen important benefits and costs cannot be expressed in monetary units, BCA is less useful, and it can even be misleading, because the calculation of net benefits in such cases does not provide a full evaluation of all relevant benefits and costs.'' Circular A–4 at 10. The EPA's Guidelines for Preparing Economic Analyses also recognizes the limitations of BCA, noting that ''[m]ost important, [BCA] requires assigning monetized values to non-market benefits and costs. In practice it can be very difficult or even impossible to quantify gains and losses in monetary terms (*e.g.,* the loss of a species, intangible effects).'' Guidelines, Appendix A at A–7.

We also pointed out in the 2015 Proposal that national level BCAs may not account for important distributional effects, such as impacts to the most exposed and most sensitive individuals in a population. See 80 FR 75040 (December 1, 2015). These distributional effects and equity considerations are often considered outside of (or supplementary to) analyses like BCAs that evaluate whether actions improve economic efficiency (*i.e.,* increase net benefits). For example, children near a facility emitting substantial amounts of lead are at significantly greater risk of neurocognitive effects (including lost IQ points) and other adverse health effects. One perspective on the costs and benefits of controlling lead pollution would be to aggregate those costs and benefits across society, as in a BCA net benefits calculation. However, neither costs nor benefits are spread uniformly across society and failing to take account of that can overlook significant health risks for sensitive subpopulations, such as children. Similarly, in the context of this determination, where we have found disproportionate risk for certain highly exposed or sensitive populations, such considerations are also particularly relevant. We note too that OMB Circular A–4 highlights the special challenges associated with the valuation of health outcomes for children and infants, because it is ''rarely feasible to measure a child's willingness to pay for health improvement'' and market valuations such as increased ''wage premiums demanded by workers to accept hazardous jobs are not readily transferred to rules that accomplish health gains for children.'' Circular A–4 at 31.

With those caveats, in this final action we consider the use of a BCA approach, based on the 2011 RIA performed as part of the original MATS rulemaking, as another way to make the CAA section 112(n)(1)(A) determination of whether it is appropriate to regulate HAP emissions from EGUs. Applying the alternative approach, based on the 2011 RIA, we find that it is appropriate to regulate EGUs for HAP under CAA section 112(n)(1)(A). In the 2011 RIA, the total benefits of MATS were estimated to vastly exceed the total costs of the regulation. As we found when applying the 2016 alternative approach, the formal BCA that the EPA performed for the 2012 MATS Final Rule estimated that the final MATS rule would yield annual monetized total benefits (in 2007 dollars) of between $37 billion to $90 billion using a 3-percent discount rate and between $33 billion to $81 billion using a 7-percent discount rate; this compares to projected annual compliance costs of $9.6 billion. This estimate of benefits was limited to those outcomes the EPA was able to monetize. Despite the fact that these estimates captured only a portion of the benefits of the rule, excluding many important HAP and criteria pollutant-related endpoints which the EPA was unable to monetize (see section III.A.3) and instead discussed qualitatively in the 2011 RIA, it was clear that MATS was projected to generate overwhelmingly net positive effects on society. We continue to think that the formal BCA approach independently supports the conclusion that regulation of HAP emissions from EGUs is appropriate.[69]

Although it is not possible for the EPA to update the entire comprehensive cost estimate found in the 2011 RIA, we think the information presented in sections III.A and III.B further demonstrates that the net benefits of the MATS rule are overwhelmingly positive. That is, we have attempted to quantify additional risks from EGU HAP exposures, including risks of premature death from heart attacks that result from methylmercury associated with domestic EGU emissions, and we believe the 2011 RIA's projected cost was likely significantly overestimated. Therefore, we find that if BCA is a reasonable tool to use in the context of the EPA's determination under CAA section 112(n)(1)(A), newer data collected since 2011 overwhelmingly support an affirmative determination. Further, that both analytical approaches to addressing the inquiry posed by *Michigan* lead to the same result reinforces the reasonableness of the EPA's ultimate decision that it is appropriate and necessary to regulate HAP emissions from EGUs.

F. The Administrator's Final Determination

In this action, the EPA has re-examined the extensive record, amassed over more than 2 decades, consistently identifying the advantages of regulating HAP from EGUs and evaluating the costs of doing so. We have, for purposes of this action, also updated information on both benefits and costs. Of note, we find that new scientific literature indicates that methylmercury exposure from EGUs, absent regulation, poses cardiovascular and neurodevelopmental risks, particularly to those most exposed to this pollution. With respect to costs, we explain the combination of factors that occurred since the promulgation of MATS that leads us to believe that the

[69] Under this alternative approach, the EPA does not give additional weight to sensitive populations or the most exposed individuals.

projected, sector-level $9.6 billion estimate of the cost of compliance of the rule in 2015 was likely significantly overestimated. We have used two different approaches to considering all of this information, applying first our preferred totality-of-the-circumstances methodology weighing of benefits and costs and focusing particularly on those factors that we were instructed by the statute to study under CAA section 112(n)(1), and next using a formal benefit-cost approach consistent with established guidance and economic principles. Under either approach, whether looking at only the information available at the time of our initial decision to regulate or at all currently available information, we conclude that it remains appropriate and necessary to regulate EGUs for HAP. Substantial emission reductions have occurred after implementation of MATS and these emission limits provide the only Federal guarantee of emission reductions from EGUs, which, absent regulation, were the largest domestic anthropogenic source of a number of HAP. Finalizing this affirmative threshold determination provides important certainty about the future of MATS for regulated industry, states, other stakeholders, and the public.

IV. Public Comments and Responses

In this final action, the EPA is revoking the previous 2020 finding that it is not appropriate and necessary to regulate coal- and oil-fired EGUs under CAA section 112, and reaffirming that it remains appropriate and necessary to regulate HAP emissions from EGUs while considering costs. In the 2022 Proposal, the EPA described a decisional framework for making the appropriate and necessary determination under CAA section 112(n)(1)(A) and presented detailed information about the advantages and disadvantages of EGU HAP regulation to be weighed within that framework. Additionally, the EPA acknowledged ''the difficulties associated with characterizing risks from HAP emissions'' discussed in section III.A of the 2022 Proposal and solicited public comment on ''the health and environmental hazards of EGU HAP emissions . . . and the appropriate approaches for quantifying such risks, as well as any information about additional risks and hazards not discussed in [the] proposal.'' The EPA also explicitly requested public comment on: (1) the updated data and methods that the EPA used to conclude the projected cost estimates of the 2011 RIA were likely significantly overestimated; (2) whether it is reasonable to consider the advantages associated with non-HAP emission reductions that result from the application of HAP controls as part of our totality-of-the-circumstances approach; and (3) whether the EPA should continue to consider, on an alternative basis, results from a BCA in the appropriate and necessary determination.

The EPA received a number of comment submissions from groups representing states, tribes, industries, environmental organizations, health organizations, community organizations, environmental justice organizations, and others. The EPA has taken all the submitted comments into consideration in preparing this final action. All of the comments have been summarized and the EPA has provided detailed responses to the significant comments either here in this final action or in the 2023 RTC Document which is available in the rulemaking docket. This section presents a summary of the most impactful comments received on the 2022 Proposal and the EPA response to those comments.

A. Comments on the Public Health and Environmental Hazards Associated With Emissions From EGUs

This section of the document addresses comments related to the EPA's characterization of the public health (and other environmental) hazards associated with EGU HAP emissions, including whether the existing analyses are sufficient to determine that EGU HAP regulation is appropriate and necessary in light of costs. This section also addresses comments received regarding the EJ implications of this action.

1. Evaluation of the Public Health and Environmental Advantages of Regulating HAP From U.S. EGUs

Comment: Numerous commenters affirmed the EPA's conclusions about the ample record of evidence indicating the substantial public health burden associated with EGU HAP emissions. These commenters noted that research has shown that toxic pollution emitted by power plants is harmful to respiratory, cardiovascular, nervous, endocrine, and other essential life systems. Many commenters added that children, older adults, pregnant women, and people with asthma, lung diseases, cardiovascular diseases, and diabetics are particularly susceptible to EGU HAP emissions. These commenters highlighted estimates from the Centers for Disease Control and Prevention (CDC) that about 7 percent of child-bearing aged women in the U.S. have a blood mercury level that is unsafe for a developing fetus. According to the commenters, as a result, children can be predisposed to significant health harm due to methylmercury exposure over the course of pregnancy leading to low birth weights, growth restrictions, prematurity, and infant mortality. Additionally, these commenters noted that HAP emissions from power plants are also a component of particulate pollution that can lead to heart attacks and strokes on a wide scale, killing thousands of people each year. These commenters emphasized that people of color, people with low incomes, and people who work or exercise outdoors are especially adversely impacted. Beyond the public health burden, numerous commenters also affirmed the EPA's conclusions about other environmental burdens caused by EGU HAP emissions. These commenters observed that harmful effects of mercury on birds and mammals are especially well-established, pointing to a 2018 review [70] of the literature on mercury toxicity in birds that identified serious physiological effects, such as disrupted blood and organ biochemistry, varying hormone levels, suppression of the immune system, inhibition of growth, as well as behavioral effects and reproductive impacts. These commenters agreed with the EPA that the detrimental effects of methylmercury on wildlife can propagate into impacts on human welfare to the extent they adversely influence economies that depend on robust ecosystems (*e.g.,* fishing, tourism). They noted that tissue concentrations of mercury in several fish species have been found to exceed levels at which significant impacts on reproductive outcomes occur and that some state public health officials continue to issue mercury advisories warning people to limit their intake of fish from many U.S. lakes and rivers. These commenters noted the MATS rule was highly effective in reducing mercury and other HAP emissions from power plants between 2011 and 2017. In sum, this set of commenters supported the EPA's determination in the 2022 Proposal that there are significant impacts on human health and the environment from EGU HAP emissions and that this public health and environmental burden must be highly weighted when assessing the advantages and disadvantages of regulating EGUs under CAA section 112.

[70] Collin A. Eagles-Smith *et al., Modulators of mercury risk to wildlife and humans in the context of rapid global change.* 47 Ambio 170, 177 (2018).

Response: The EPA agrees that scientific evidence shows that exposure to methylmercury through fish consumption is associated with a range of adverse health effects and that certain sensitive populations (*e.g.,* children, infants, women of childbearing age) are especially affected. The EPA placed significant weight on the importance of reducing risks to these particularly impacted populations in the 2022 Proposal when determining that EGU HAP emissions reductions were appropriate and necessary (see 87 FR 7664–7666). The EPA further agrees that there are significant health and environmental burdens associated with other non-mercury EGU HAP emissions, and that these adverse health impacts can manifest themselves in a number of different ways. When viewed in whole, the scientific evidence for significant health and environmental burdens associated with EGU HAP emissions is strong, longstanding, and largely undisputed. As a result, the expected improvements to public health and the environment associated with the regulation of EGU HAP emissions carry significant weight in the EPA's final decision to reaffirm the appropriate and necessary determination.

Comment: Other commenters, however, claimed that the EPA analyses described in the 2022 Proposal demonstrated that the public health hazards from EGU HAP emissions are low and appear to fall within ranges that the EPA has previously concluded were acceptable. These commenters asserted that the risk associated with HAP emissions from coal-fired EGUs is well below the level that justifies regulation under CAA section 112. Citing the EPA's 2011 Non-Hg HAP Assessment,[71] they noted that the highest cancer risk associated with an oil-fired utility in the EPA's analysis was 20-in-1 million (based on nickel emissions) and that the highest risk from any coal-fired facility was only 5-in-1 million (based on chromium VI or nickel emissions). They asserted that these levels of risk are below the levels that the EPA finds acceptable for other industries and said the EPA should explain why additional regulation was needed when the EPA's threshold for an acceptable level of risk with an ample margin of safety for cancer is 100-in-1 million, as established in the 1989 Benzene NESHAP. Commenters further noted that the EPA has sometimes found even higher risks to be acceptable, such as in the RTR for the HAP standards for the Miscellaneous Organic Chemical Manufacturing industry.

Response: When conducting any determination of risk, the EPA considers all of the risk metrics associated with the emissions being investigated, including metrics not raised by these commenters such as distributions of population exposures and incidence. In this determination, the EPA concluded that the risks met the criteria for an appropriate and necessary finding based on all of the available information, especially the noncancer hazards. The EPA acknowledges that a 5- to 20-in-1 million risk for cancer falls within the acceptable range. However, we have not established, under section 112 of the CAA, a numerical range for risk acceptability for noncancer effects as we have with carcinogens, nor have we determined that there is a bright line above which risks are unacceptable. As exposure increases above a reference level, our confidence that the public or susceptible subpopulations will not experience adverse health effects decreases and the likelihood that an effect will occur increases. The principal effects of concern in making the risk determination for MATS were the noncancer effects associated with mercury exposure, for which EGUs were the largest emitter nationally. The potential for members of the public to experience increased incidence of IQ loss and cardiovascular disease, and exceed the RfD for noncancer effects from mercury, reduced our confidence that the public is protected from adverse health effects and diminished our ability to determine that such exposures are acceptable.

Comment: Several commenters asserted that the EPA's justification for regulating EGU HAP is ''highly uncertain'' and highlighted some specific elements of the 2022 Proposal where the EPA acknowledged uncertainty in the analyses. They highlighted four elements of the EPA's evaluation of health burden in the 2022 Proposal to support this assertion. First, while the EPA identified 10 percent of computer-modeled watersheds where deposition of mercury from EGUs could lead to exposures exceeding the RfD for subsistence fishers, commenters noted that the RfD is an estimate ''with uncertainty spanning perhaps an order of magnitude'' and further that the EPA could not determine whether subsistence fishers are actually present in those watersheds (see 2022 Proposal, at 7638–39). Second, these commenters concluded that the EPA claim of a benefit of 511 IQ points across the affected population of 240,000 hypothetical children (see 2022 Proposal, at 7639, and 77 FR 9428) was too small to be measured in any real-world evaluation. Third, they questioned the EPA's post-2016 analyses that indicated the IQ points lost annually due to consumption of U.S. EGU mercury in commercially sourced fish could be as low as 80 IQ points or as high as 12,600 IQ points, given that the EPA itself indicated the analyses are merely ''screening-level assessments'' designed as ''broad-bounding exercises'' that do not provide a ''high-confidence estimate of risk'' (87 FR 7641–7644). Fourth, some commenters questioned the significance of the EPA's screening analyses estimating mortality due to cardiovascular impacts from methylmercury, which indicated excess deaths may range from 5 to 91, given that the EPA admits only a ''limited body of existing literature'' exists on associations between mercury and various cardiovascular outcomes (87 FR 7639). In sum, these commenters conclude that the magnitude and uncertainty of the health and environmental advantages associated with reducing EGU HAP emissions are insufficient to justify regulation of such emissions.

Response: The EPA disagrees that there is insufficient evidence justifying regulation of EGU HAP emissions. The 2022 Proposal described the voluminous and scientifically rigorous body of evidence documenting the significant hazards to public health associated with HAP emissions from EGUs, particularly to certain vulnerable populations that bear greater risk from these emissions than the general public (87 FR 7667).[72] As discussed in section III.A.1 above, the D.C. Circuit found that the EPA's risk finding as to mercury alone established a significant public health concern. *White Stallion Energy Center* v. *EPA,* 748 F.3d 1222, 1245 (D.C. Cir. 2014). After weighing the totality of the circumstances, the EPA concludes that regulation of HAP from EGUs is appropriate while considering cost. Indeed, the 1990 amendments to the CAA and revised structure of CAA section 112 indicate Congress' clear intent to aggressively regulate HAP emissions to protect public health even where fully quantifying benefits of such risks is difficult. This comment

[71] U.S. EPA. 2011. *Supplement to the Non-Hg Case Study Chronic Inhalation Risk Assessment In Support of the Appropriate and Necessary Finding for Coal- and Oil-Fired Electric Generating Units.* Office of Air Quality Planning and Standards. November. EPA–452/R–11–013. Docket ID Item No. EPA–HQ–OAR–2009–0234–19912.

[72] Such evidence is presented in the three studies required under CAA section 112(n)(1) and in subsequent analyses by the EPA and others, such as the 2021 Risk TSD, which are included in the docket for this rulemaking.

identifies specific elements of this ''totality'' and asserts that the uncertainty associated with each of these effects individually, when considered along with the magnitude of any individual effect, is insufficient to justify regulation. The EPA addresses each of the individual elements of the comment in detail below but reiterates that the neurodevelopmental and cardiovascular risks associated with consumption of fish impacted by domestic EGU HAP emissions by subsistence and recreational fishers, and the general population, are well-established despite residual challenges in precisely quantifying the impacts of those risks.

The EPA recognizes that an RfD is defined as an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Uncertainty is commonly addressed by default values (*e.g.,* factors of 10 or 3) used in the absence of compound-specific data. Thus, there may be potential for overestimating risk however, there is also a possibility that risks could be underestimated. The methylmercury RfD is based on the dose-response relationship between prenatal exposure to mercury and reduced performance on neurodevelopmental tests in 7-year-old children. Importantly, there was no evidence of a threshold for neurotoxicity within the range of exposures in the principal study used to derive the RfD (USEPA, 2001). A 10-fold factor was applied to account for pharmacokinetic and pharmacodynamic uncertainty. In general, the RfD does not define an exposure level corresponding to zero risk; moreover, the RfD does not represent a bright line at which individuals are at risk of adverse effects. However, the RfD is appropriate for identifying exposure scenarios of potential concern from a public health standpoint.

The at-risk watershed subsistence fisher analysis that the EPA completed for MATS had this type of public health hazard focus. Specifically, we estimated the fraction of watersheds where exposure to methylmercury sourced from U.S. EGUs resulted in exposures above the RfD, thereby suggesting the increased likelihood of adverse health effects (but we did not quantify the specific risk or incidence of specific health effects such as IQ loss). The EPA recognizes that the RfD does not represent a concentration response (C–R) function and therefore cannot be used in estimating the incidence of a particular health effect (*i.e.,* the specific magnitude of risk for a particular health endpoint). While a C–R function is available to measure incidence of IQ loss as a neurodevelopmental effect from exposure to methylmercury, it was not possible to quantify the number of subsistence fishers active at specific waterbodies or within specific regions. The EPA readily acknowledges that this is a limitation that impacts both risk and benefits analyses. A key limitation stemming from this inability to characterize this activity is that it is not possible to include subsistence fishers in quantitative estimates of monetized neurological benefits associated with MATS (which is a significant limitation that likely reduces overall quantified benefits).[73] However, the inability to quantify subsistence fishing activity for specific watersheds does not mean that this activity is absent, as can be seen by the variety of surveys capturing self-caught fish consumption rates for this population suggesting that there are individuals engaging in this activity (see section 1.4.3 of the 2011 Final Mercury TSD—at risk watershed analysis). Nevertheless, the inability to quantify subsistence fisher activity and thereby enumerate this population allowing its inclusion as part of the benefit estimate did result in an underestimate of overall benefits (*i.e.,* rule-related reductions in IQ impacts to the children of subsistence fishers were not enumerated as part of overall benefits).

Regarding the comment related to the modeling of IQ loss for recreational anglers that the average IQ loss per associated child is low, the EPA states that on a population level, this low loss is significant.[74] The EPA also notes that the full impact of IQ loss on the fishing population was likely underestimated, given that sufficient data were not available to quantify impacts on the subsistence fisher population. Furthermore, the EPA notes that the recreational angler analysis focused on estimating total lost IQ points (for purposes of valuation) and did not attempt to estimate the magnitude of differential risk across those recreational anglers (and their exposed children) which would likely result from differences in ingestion rates and the magnitude of EGU-sourced mercury impacts to fish in specific watersheds. It is likely that adverse neurodevelopmental impacts would be unevenly distributed in the recreational angler population, and that some individuals experience more significant impacts than others. Our analysis, which focused on average impacts, therefore may underestimate effects on more severely impacted individuals. Furthermore, the EPA recognized at the time that the benefit analysis, by only focusing on recreational anglers, was limited in not addressing other populations potentially impacted by U.S. EGU-sourced mercury (*e.g.,* commercial fish and subsistence fishers). As part of the current review, the EPA has attempted to remedy some of these limitations through the inclusion of bounding analyses for both IQ loss and MI-related mortality potentially experienced by the general population (see 2021 Risk TSD). In the context of assessing public health hazards associated with U.S. EGU-sourced mercury, the EPA notes that the analysis of at-risk watersheds associated with subsistence fisher exposure to mercury (2011 Final Mercury TSD) and the refinements to that subsistence fisher analysis focusing on increased potential for MI mortality which were completed for the current review (2021 Risk TSD, section c) are particularly relevant since they focus on those populations (subsistence fishers) likely to experience elevated exposure to U.S. EGU-sourced mercury through self-caught fish consumption. In the end, the EPA asserts that it is still important to consider these impacts as one of the many advantages of EGU HAP regulation.

Regarding the commenter's observations about the screening-level nature of the IQ loss estimates generated for the general fish-consuming population and that they are a broad bounding exercise, the EPA does not dispute either of these points. In assessing the potential for public health hazard associated with U.S. EGU-sourced mercury, the EPA recognized the merit of attempting to characterize the magnitude of IQ loss and MI-related

[73] We do note that the bounding analyses focusing on IQ loss and IHD-related mortality for the general population of fish consumers in the U.S. while possibly capturing some fraction of risk impacts to subsistence fishers likely did not fully capture this dimension of MATS-related impacts. This reflects the possibility that the NHANES data which is a key input to these bounding estimates may not fully capture mercury exposure (hair-mercury levels in women) to this more highly exposed and smaller subgroup of self-caught fish consumers (see 2021 Risk TSD for additional detail on the methodology used in generating the bounding estimates).

[74] It is also important to note, that even a small shift in the population mean IQ may be significant from a public health perspective because such a shift could yield a larger proportion of individuals functioning in the low range of the IQ distribution, which is associated with increased risk of educational, vocational, and social failure, as well as reduce the proportion of individuals with high IQ scores (2013 Pb Integrated Science Assessment (ISA), section 1.9.1. U.S. EPA, Integrated Science Assessment for Lead. Washington, DC, EPA/600/R–10/075F).

mortality for the general fish consuming population. Furthermore, in attempting to characterize the magnitude of risk for these two important health endpoints, the EPA concluded that different approaches can be used reflecting different degrees of complexity and sophistication and that these different approaches have tradeoffs. In developing the bounding analyses for these scenarios presented in the 2021 Risk TSD and summarized in the 2022 Proposal, the EPA focused on developing analyses that would provide an order-of magnitude characterization of risk to inform the appropriate and necessary determination. The EPA recognizes that it could have attempted a more complex and sophisticated modeling of point-estimate risk for each scenario (*i.e.,* linking U.S. EGU mercury emissions to dispersion over fisheries to specific species impacts to U.S. population exposure) but we note that this still would have been subject to uncertainty and that, in the EPA's estimation, the bounding analyses generated were sufficient to help inform the public health determination (and that given their bounding nature, they require a lower degree of overall complexity compared with a point-estimate of risk).

Regarding the observation that the estimate of MI mortality reflects on a limited body of existing literature, the EPA acknowledges challenges in developing a C–R function for methylmercury exposure and cardiovascular effects, including those referenced by the EPA in the 2022 Proposal (as cited by the commenter). However, as described in the 2022 Proposal, the EPA finds that the conclusions and recommendations by an expert panel convened in 2010 by the EPA to look at the possibility of deriving a C–R function for cardiovascular effects associated with methylmercury exposure (as reported in Roman *et al.,* 2011), together with studies published since that workshop including, Hu *et al.,* 2021 provide sufficient support for the development of a bounding analysis for the MI mortality endpoint. Specifically, we note that Roman *et al.,* 2011 concluded that ''We found the body of evidence exploring the link between MeHg and acute myocardial infarction (MI) to be sufficiently strong to support its inclusion in future benefits analyses, based both on direct epidemiological evidence of an MeHg–MI link and on the association of MeHg with intermediary impacts that contribute to MI risk. Although additional research in this area would be beneficial to further clarify key characteristics of this relationship and the biological mechanisms that underlie it, we consider the current epidemiological literature sufficiently robust to support the development of a dose—response function.'' Furthermore, the expert panel recommended ''the development of a dose—response function relating MeHg exposures with MIs for use in regulatory benefits analyses of future rules targeting Hg air emissions.'' In addition, the expert panel provided specific technical guidance regarding derivation of a C–R function, including that MI mortality risk only be modeled above methylmercury exposure levels associated with the Kuopio Ischemic Heart Disease Risk Factory Study (KIHD) and European Multicenter Case-Control Study on Antioxidants, Myocardial Infarction, and Cancer of the Breast Study (EURAMIC)-based studies that the panel recommended as the basis for deriving risk models for this endpoint. The EPA has followed this guidance provided by the panel in designing the bounding analysis. The EPA acknowledges that there is a lack of consensus regarding the specification of the C–R function for cardiovascular effects and methylmercury exposure, but notes that a lack of consensus regarding the C–R function is not uncommon in risk assessment. In the case of methylmercury, a critical factor in specifying the C–R function is determining which cardiovascular health endpoints will be covered. However, just because risk assessment teams can develop different C–R functions reflecting different study designs regarding factors such as the health endpoints modeled does not mean that there is insufficient overall confidence to conduct a risk assessment. Rather this implies that different approaches can be taken regarding the tradeoff between the design of the risk assessment (*e.g.,* the range of health endpoints modeled) and overall confidence in the risk estimates generated. For example, other commenters utilized an even broader range of cardiovascular-related endpoints in order to capture a wider range of potential benefits. Conversely, the EPA asserts that there is increased confidence associated with a more focused (MI mortality-based) assessment of risk although we acknowledge that we are likely to underestimate potential benefits by excluding other cardiovascular effects which may be affected by methylmercury.

2. Potential Underestimation of the Health Benefits of U.S. EGU HAP Reductions

Comment: Numerous commenters, while supportive of the proposal to reaffirm the appropriate and necessary determination, stated concern that the scope of the overall RIA quantitative air toxics benefits analysis remains incomplete and conservative, such that commenters claim the EPA did not capture the full benefits of EGU HAP reductions. Specifically, these commenters note that the RIA does not address all mercury health endpoints, other HAP-reduction health benefits, or benefits to wildlife. The commenters asserted that the RIA does not fully reflect the state-of-the science and that it is essential that the EPA expand the scope of benefits addressed and incorporate available scientific information and methods more fully so as to provide an enhanced description of quantitative benefits. The commenters further asserted that ''by underestimating and dismissing mercury[-reduction] benefits, the EPA has provided fodder to those who wish to jettison the regulation and discredit the Agency.'' They said a more accurate and expanded analysis of benefits that reflects the state of the science would help to protect the EPA from repeated attacks on the standards and would also allow the public to understand why it is so important to control mercury and other HAP emissions from one of the highest emitting sectors in the U.S.

Response: The EPA agrees that it is important to consider the full set of health and environmental improvements associated with mercury reductions. The 2022 Proposal highlights the known health risks associated with mercury pollution throughout. Section III.A.2 of the 2022 Proposal provides an extensive overview of the health effects associated with methylmercury, including neurodevelopmental, cardiovascular, and immunotoxic effects; as well as an overview of the ecological effects of methylmercury (87 FR 7637–7641). The EPA confirmed in the 2022 Proposal that mercury is highly toxic, persistent, and bioaccumulates in food chains; and that, when evaluating the totality of the circumstances, it is appropriate and necessary to regulate HAP emissions from coal- and oil-fired power plants. As part of the current review, the EPA also expanded the assessment of risk associated with U.S. EGU-sourced mercury exposure to include quantitative estimates of IQ loss and MI-related mortality in the general population associated with commercial

fish consumption. Acknowledging the uncertainties associated with linking changes in mercury emissions to health effects, these bounding analyses estimates are intended to present order-of-magnitude estimates of potential effects (87 FR 7641–7644).

However, the EPA agrees with the commenters that the BCA in the 2011 RIA for MATS does not quantitatively evaluate all possible HAP-related health and environmental effects, exposure pathways, and affected populations. As a result, the BCA in the 2011 RIA underestimated the total benefits of MATS. The EPA acknowledged this in section III.A.4 of the 2022 Proposal, noting that it is technically challenging to quantitatively estimate the extent to which EGU HAP emissions will result in adverse effects across the U.S. population (87 FR 7664).

The EPA also acknowledges receipt of comments that suggest the quantitative benefits of methylmercury reductions are larger than what the EPA estimated in the original 2011 RIA and that the value of the changes associated with cardiovascular mortality are also larger than what the EPA estimated in the bounding analyses described in the 2021 Risk TSD and section III.A.3 of the 2022 Proposal. That said, the EPA disagrees with the commenters' assertion that additional quantitative analyses of the benefits of EGU HAP are needed to successfully support the MATS appropriate and necessary determination. The EPA recognizes that the available evidence provided by commenters suggests that the result of additional quantitative analyses would yield even higher estimates of the benefits of EGU HAP emissions reductions, which would further support the EPA's determination that regulating EGU HAP emissions is appropriate and necessary under either the EPA's preferred totality-of-the-circumstances or alternative BCA approach. However, while it may be possible to generate updated estimates of risk using more sophisticated modeling approaches, the resulting risk and benefit estimates will be subject to increased uncertainty due to their greater data requirements and the need for subjective judgment in bridging certain analytical modeling steps given existing data gaps. This additional analytical uncertainty and the methodological choices made within any new quantitative analyses would open new dimensions to debate. Still, it is worth noting that the benefits shown in the bounding analyses of both IQ loss and MI mortality in the general population (as completed by the EPA for the 2022 Proposal) are not trivial and could result in substantial benefits ranging up to $50 million and $720 million, respectively (87 FR 7647 and 2021 Risk TSD, sections i and ii).

Regarding potential benefits associated with non-mercury HAP, the EPA recognizes that MATS is likely to produce a range of non-cancer and cancer risk reduction benefits. However, readily available toxicity factors, while allowing the magnitude of public health hazard to be assessed, did not support the modeling of population-level risk with sufficient confidence which is needed to estimate monetized benefits. The EPA acknowledges that this represents a conservative approach to estimating total benefits. Regarding the modeling of cumulative exposure and disproportionate impacts from HAP on low-income, immigrant, Indigenous, and communities of color, the EPA recognizes these scenarios as being important to good risk and benefits analysis in the regulatory context. Consequently, the national-scale watershed-level analysis of subsistence fisher related risk associated with mercury exposure (2011 Final Mercury TSD) included coverage for populations that fall into these EJ-related categories. In summary, the EPA's conclusion is that new analyses, in the context of this specific action to reaffirm the appropriate and necessary determination, would add uncertainty to the quantitative estimate of benefits, further delay finalization of the appropriate and necessary determination, and would not ultimately modify the EPA's existing affirmation that EGU HAP regulation is appropriate and necessary.

Comment: Another set of commenters, who opposed the proposal to reaffirm the appropriate and necessary determination, stated concern that the EPA leans too heavily on the idea that most of the HAP benefits cannot be quantified or monetized. The commenters said the EPA must ''decide . . . within the limits of reasonable interpretation [] how to account for cost.'' (*see Michigan,* 576 U.S. at 759; *see* also, *e.g., Pub. Citizen* v. *Fed. Motor Carrier Safety Admin.,* 374 F.3d 1209, 1219 (D.C. Cir. 2004)). These commenters argued it is critical that the EPA can explain how much the regulation costs and ''understand the benefits from the regulations'' (*White Stallion Energy Ctr.,* 748 F.3d at 1258–59). They further argued that regulatory decisions founded on the possibility of a benefit that cannot be quantified or monetized do not meet Congress' threshold to regulate EGUs under CAA section 112. The commenters quoted from the *Michigan* court case (576 U.S. at 757) that ''[I]f uncertainty about the need for regulation were the only reason to treat power plants differently, Congress would have required the Agency to decide only whether regulation remains 'necessary,' not whether regulation is 'appropriate and necessary.'''

Response: The EPA disagrees with the commenter's assertion that the EPA has not adequately explained the large and significant benefits associated with EGU HAP control, and disagrees with the assertion that the EPA does not meet Congress' threshold to regulate EGUs under CAA section 112 unless benefits are quantified or monetized. In section III.A of the 2022 Proposal, the EPA summarized the long-standing and extensive body of evidence regarding the adverse human health impacts of mercury emissions and introduced two specific mercury-related risk analyses which provided a screening-level assessment of quantified benefits associated with the MATS action. While the EPA has recognized the difficulty in quantifying and monetizing certain benefits of regulating HAP, that does not mean such benefits are simply ''possible'' benefits of regulation. *See e.g., Pub. Citizen* v. *Fed. Motor Carrier Safety Admin.,* 374 F.3d 1209, 1219 (D.C. Cir. 2004) (''The mere fact that the magnitude of . . . effects is *uncertain* is no justification for *disregarding* the effect entirely.'') (emphasis in original). Indeed, in *White Stallion Energy Center* v. *EPA,* the D.C. Circuit unanimously agreed with the EPA that mercury emissions pose a significant threat to public health. 748 F.3d 1222, 1246 (D.C. Cir. 2015). And, the Supreme Court in *Michigan* v. *EPA* did not grapple with the specific type of cost analysis that the EPA should conduct, and did not require the EPA to conduct a formal BCA in making the appropriate and necessary determination. See 576 U.S. at 759. The EPA's preferred totality-of-the-circumstances approach, discussed in detail in section III.D, therefore allows the EPA to give weight to advantages, such as reduced human exposure to HAP emissions that result in detrimental health outcomes, which cannot be quantified or monetized due to uncertainty about the magnitude of the effects, but are nonetheless important benefits of regulating EGU HAP emissions.

Further, in section III.E of the 2022 Proposal, the EPA described an alternative approach for making the appropriate and necessary determination that applied a formal BCA based on the original 2011 RIA. This analysis showed that the total net benefits of MATS were overwhelmingly

larger than the MATS costs, even when the EPA was only able to partially monetize the benefits of regulating HAP emissions from EGUs. The new screening-level information examined by the EPA with respect to updated science and cost information only strengthened this conclusion. This comment introduces a strawman (*i.e.,* possibility of benefits that may or may not occur) that does not reflect the reality of the MATS action where the EPA has both identified quantifiable benefits that are far greater than the costs of the rule and fully described an additional set of unquantifiable benefits that justify the cost of EGU HAP regulation.

In addition, the EPA disagrees with commenters characterization of the *Michigan* decision as establishing or suggesting that regulatory decisions founded on the possibility of a benefit that cannot be quantified or monetized do not meet Congress' threshold to regulate EGUs under CAA section 112. The Court in *Michigan* explained that ''uncertainty about whether regulation of power plants would still be needed after the application of the rest of the Act's requirements,'' 576 U.S. at 757, *e.g.,* the ARP, was ''*one* of the reasons Congress treated power plants differently [under section 112.]'' *Id.* (emphasis in original). However, as commenters noted, the Supreme Court stated that ''if uncertainty about the need for regulation were the *only* reason to treat power plants differently, Congress would have required the Agency to decide only whether regulation remains 'necessary,' not whether regulation is 'appropriate *and* necessary.'" *Id.* (emphasis in original). As such the Court recognized in addition to uncertainty as to the impact of other CAA requirements on EGU HAP emissions, the EPA was tasked with an additional consideration as to whether regulation of EGU HAP was appropriate based on costs and other factors identified in the three studies required under CAA section 112(n)(1). Contrary to the commenter's suggestion, these statements by the Court do not suggest Congress established a threshold to regulate EGUs under CAA section 112, which cannot be overcome without quantified or monetized benefits.

3. Evidence Supporting the EPA's EJ Considerations

Comment: Numerous commenters stated that people who have low incomes or are members of racial or ethnic minorities bear a disproportionate burden of the health effects of air pollution, and these vulnerable people and communities in which they live deserve the protections the CAA requires the EPA to provide. These commenters asserted that the EPA's revocation of the 2016 Supplemental Finding put millions of Americans at risk, especially people of color and low-income populations who are more likely to live closer to EGUs and who likely bore a significant share of the local exposures to EGU HAP before the EPA adopted and implemented MATS. These commenters pointed to a 2022 study [75] that found that neighborhoods in which the Federal Government discouraged investment nearly 100 years ago face higher levels of air pollution today, including nitrogen dioxide and fine PM pollution. Commenters said that power plants contribute to the pollution burdens borne by Black, Indigenous, and other communities of color, which already face disproportionately high levels of air pollution.

Response: The EPA agrees that the adverse effects of EGU HAP emissions are not experienced equally across the population. The 2022 Proposal summarizes a series of screening-level analyses conducted by the EPA that suggest that certain communities of color and low-income populations experience elevated risks from methylmercury relative to the general population (87 FR 7647). The EPA acknowledges receipt of the studies submitted by commenters showing that certain historically disadvantaged populations may live in closer proximity to coal- and oil-fired EGUs, relative to other groups and agrees that evidence in that regard further strengthens the appropriate and necessary determination. We reiterate that section 112 has a particular focus on reducing HAP related risks to the most exposed and most sensitive members of the public.

Comment: Several commenters stated that the EPA must continue to give significant weight to the benefits of regulating EGUs under CAA section 112 specifically for communities of color, Indigenous communities, and low-income communities based on several statutory considerations. In the view of these commenters, Congress expressed a clear intent to reduce the harms that HAP inflict on these often disadvantaged, overburdened communities through regulation under CAA section 112. The commenters cited several CAA provisions to support this assertion: CAA section 112(n)(1)(C) which focuses on mercury impacts on sensitive populations; CAA section 112(f)(2)(A) which requires further regulation where residual risk to the individual most exposed does not fall below a specified threshold after implementation of a standard; and CAA section 112(c)(9)(B)(i) which prohibits deregulating a source category where risk to the individual most exposed does not fall below a specified threshold. These commenters noted that although the latter two provisions are phrased in terms of the risks from the emissions of a single source within the source category, it is impossible to understand the danger posed by a source's HAP emissions without also considering background exposures to toxic pollutants affecting the same health outcomes. These commenters noted that it is well established that communities of color and economically disadvantaged communities frequently are home to the individuals most exposed to toxic emissions from various industrial sources. Given the statutory goal of reducing the risks posed by regulated sources' emissions to these individuals, these commenters concluded that it is especially appropriate to regulate EGUs under CAA section 112 because communities of color and low-income communities have historically comprised a significant share of the population living near EGUs, and of populations otherwise highly exposed to risks from EGUs' emissions of HAP.

Response: The EPA agrees with the commenters that the statutory design and direction of CAA section 112 repeatedly emphasize that EPA actions developed under this provision should be designed with the most exposed and most sensitive members of the population in mind. The EPA also agrees that sensitive populations should be interpreted in a CAA section 112 context to include not just those who are most exposed to EGU HAP, based on proximity, but also those who are most at risk from exposures to EGU HAP. As noted in the 2022 Proposal (87 FR 7638), health evidence suggests that people with impaired nutritional status are especially susceptible to adverse neurodevelopmental effects from methylmercury.[76] Given that these nutritional deficits are often particularly pronounced in vulnerable communities,[77] it further justifies the need for assessing EGU HAP effects through a lens of EJ considerations.

[75] Lane, HM, Morello-Frosch R, Marshall JD, Apte JS (Lane *et al.*) 2022. *Historical Redlining is Associated with Present-Day Air Pollution Disparities in U.S. Cities. Environmental Science & Technology Letters.*

[76] U.S. EPA. 1997. *Mercury Study Report to Congress.* EPA–452/R–97–003 December 1997.

[77] *Id.*

Comment: An additional set of commenters expressed concern for the impact of methylmercury on Indian Tribes. These commenters asserted that tribes bear a greater risk from mercury exposure because many tribes catch fish for their economic livelihoods, sustenance, the exercise and continuation of treaty rights, or the continuation of cultural and religious practices. They noted that American Indians are at high risk of mercury exposure because many consume fish at far higher rates than the general public. The commenters provided evidence that some tribes consume four or five times more fish than other communities. The commenters concluded that because fish consumption is the primary pathway for human exposure to methylmercury, American Indians have suffered disproportionate health, cultural, and economic consequences from mercury emissions from power plants. They pointed to evidence that suggests the blood mercury levels of American Indians are among the highest of any racial or ethnic group in the U.S., which makes American Indians at unusually high risk for neurodevelopmental disorders, poor cardiovascular health, and other adverse effects from methylmercury exposure. They further pointed to research which suggested that some children in Great Lakes tribal populations suffer IQ losses ranging from 6.2 to 7.2 points due to methylmercury exposure. The commenters added that mercury in fish can also disrupt cultural practices and sever tribal members from their responsibilities toward the natural world. The commenters said that many tribes depend on the purity of waters for many of their cultural and religious practices. The commenters noted that tribal members can be faced with the choice of risking their health or abandoning their traditions and subsistence practices. The commenters said that subsistence or other fishing activities are a way for tribal members to ensure the continued existence of cultural practices; longstanding traditions of fishing and fish consumption are central to many tribes' cultural identity and are critical social practices that have been handed down from generation to generation. Methylmercury contamination, they said, threatens traditional Indian ways of life. Finally, these commenters acknowledged the challenges associated with the idea that the most exposed and most sensitive members of a population often represent only a small portion of the total population and that quantification of HAP specific benefits to that small group can be difficult to estimate. To that end, they supported the EPA use of a totality-of-the-circumstances approach to determining if EGU HAP regulation is appropriate and necessary.

Response: The EPA appreciates the tribal perspective raised by the commenters. The EPA is mindful of the Federal Government's trust responsibility to federally recognized tribes, which forms a key element of the Federal/tribal government-to-government relationship and which, among other things, informs how the EPA exercises its discretion in carrying out EPA activities. The EPA has acted consistently with that responsibility in developing this final action. The EPA recognizes the potential for disproportionate impacts to Native American populations from U.S. EGU-sourced methylmercury, including both the health-related impacts as well as cultural impacts referenced by the commenter. The EPA placed significant weight in the 2022 Proposal (87 FR 7666) on the importance of reducing risks to particularly impacted populations, including tribal communities. In the original 2011 Final Mercury TSD, focused on identifying at-risk watersheds associated with subsistence fishing populations, the EPA included a tribal population with substantially elevated subsistence fish consumption rates specifically to provide coverage for this at-risk population. That Native American population was included in the 2021 Risk TSD when the EPA expanded the analysis of risk to subsistence fishers to cover the potential for increased MI-related mortality risk (see Table 3 of the 2021 Risk TSD). Both of these analyses showed Native Americans living in the vicinity of the Great Lakes to be at elevated risk for both neurodevelopmental effects and MI-related mortality (due to U.S. EGU-sourced methylmercury) at the higher consumption rates (*i.e.,* 95th to 99th percentile consumption rates of 213 and 493 g/day self-caught fish consumption, respectively). For that reason, the EPA included high-end self-caught fish consumption rates in its national-scale at-risk watershed analyses focusing on subsistence fishers (see Table 3 of the 2021 Risk TSD). That analysis included 99th percentile fish consumption rates for tribal populations near the Great Lakes.

Comment: Several commenters stated that the EPA should consider new data on high-quantity fish consumers and their socioeconomic attributes and address disproportionate exposures of indigenous people, Pacific Islanders, and others. These commenters noted that data on high-frequency seafood consumers are limited in NHANES to a few hundred individuals per survey cycle and pointed to a newer study that has conducted a nationally representative survey of high-frequency fish consumers.[78] The inclusion criterion for this study was consumption of more than three fish meals per week, which corresponds to the 95th percentile consumer in the NHANES survey. In the view of these commenters, the newer data provide more appropriate seafood consumption rates and suggest that values used in the 2011 RIA underestimate methylmercury exposure and associated health risks, especially for lower income households and those with less than a high school education. Like other commenters above, they noted evidence that disparities in methylmercury exposure exist in the U.S. population. They cited the finding that U.S. individuals who identified their ethnicity as ''other'' (*i.e.,* Asian, Pacific and Caribbean Islander, Native American, Alaska Native, multi-racial and unknown race) consistently have blood mercury levels that are higher than other demographic groups between 2001–2018 based on NHANES/CDC data. These commenters therefore requested that the EPA incorporate updated consumption data to estimate exposures of vulnerable groups more accurately.

Response: The EPA acknowledges the commenters highlighting the additional study on fish consumption rates across populations and the summary of CDC/NHANES blood mercury data by ethnicity and fish consumption rates. The EPA continues to assert that the analyses discussed in the 2022 Proposal (87 FR 7646–7647), while subject to uncertainties related to input choices on fish consumption rates and subsequent potential underestimation, are sufficient to demonstrate evidence of uneven distributions in the impacts of U.S. EGU mercury emissions. The EPA agrees that incorporating updated data would provide a more comprehensive consideration of the EJ implications of this action, but the time it would take to generate those analyses would have further delayed finalizing this action and would not change the EPA's binary decision that U.S. EGU HAP regulation is appropriate and necessary.

[78] K. von Stackelberg, M. Li, E. Sunderland. *Results of a national survey of high-frequency fish consumers in the United States.* Environ. Res., 158 (2017), pp. 126–136. *https://doi.org/10.1016/j.envres.2017.05.042.*

B. Comments on Consideration of Cost of Regulating EGUs for HAP

This section of the document addresses comments related to the EPA's analysis of compliance costs in the 2022 Proposal.

1. EPA Cost Analyses Inappropriately Focus on Whether Costs Are Bearable, Not if They Are Appropriate

Comment: Commenters opposed the proposal's ''affordability'' basis and said that the EPA had inappropriately concluded that MACT standards for EGUs are appropriate and necessary because the power sector and electricity consumers can survive the added burden of MACT regulations. Commenters said that, with the phrase ''appropriate and necessary,'' Congress could not possibly have intended to grant the EPA unbounded authority to regulate, so the affordability test was inconsistent with the EPA's statutory authority. Commenters additionally asserted that the EPA's affordability test was applied too broadly (across the entire power sector) and inappropriately included natural gas-fired facilities that realized competitive advantages under MATS. Commenters said the affordability test had the effect of spreading MATS impacts over more than the burdened portion of the sector and said this approach makes impacts look less significant than if the EPA had compared compliance costs to only the portion of the power sector within source categories affected by MATS. Commenters also said that the EPA's burden estimates ignored clear and direct impacts to other industries that were affected by the rule and said the EPA failed to reasonably analyze disadvantages of its actions as required by the *Michigan* finding. Commenters requested that the EPA reconsider its finding in a way that focuses on impacts at coal- and oil-fired units as well as on impacts at other related industries like coal mining.

Response: The EPA disagrees with commenters that its consideration of costs is confined to whether the power sector can bear the cost of compliance (*i.e.* an ''affordability test''). Rather, in the preferred totality-of-the-circumstances approach, the Administrator considers the disadvantages of regulation against its advantages to determine whether it is appropriate and necessary to regulate EGU HAP emissions under CAA section 112. More discussion on this approach and how the approach is consistent with the Supreme Court's decision in *Michigan* v. *EPA* is presented in section IV.D.2 below.

As explained in section III.B.1 of the 2022 Proposal, the EPA's estimate of the MATS compliance costs reflects the cost to the entire power sector. MATS is an economically consequential rulemaking that was expected to induce changes in both electricity and fuel markets. To focus on the projected impact of MATS on only affected coal- and oil-fired EGUs would produce an incomplete estimate of the entire cost of complying with the rule and, thus, lead to an inappropriate consideration of the costs of the final MATS rule. The costs associated with installation and operation of pollution controls (or coal switching) at some affected EGUs can influence the generation decisions of both EGUs that are regulated by MATS and those that are not regulated by MATS. The electric power system is complex and interconnected, and the generation decisions of a single affected EGU can influence the dispatch of other EGUs, wholesale power prices, and fuel prices. Therefore, for a rule with the scope and projected impacts of MATS, it is reasonable for the EPA to consider the full cost of the rule by capturing costs expended at all electric generators, not just those subject to emissions requirements under MATS.

Furthermore, an evaluation of the costs borne solely by EGUs subject to MATS would need to account for the potential ability of owners of these EGUs to recoup their increased expenditures through higher electricity prices or else an estimate of the costs of MATS borne by the owners of those EGUs (*i.e.,* their economic incidence) would be an overestimate. However, in doing so, the costs borne by the consumers of electricity from these higher prices would be ignored, which the EPA finds inappropriate. Therefore, the EPA determined it was appropriate to account for all the costs that may be expended as a result of the rule that could be reasonably estimated, including changes in fuel expenditures, recognizing that these expenditures would ultimately be borne either by electricity consumers or electricity producers, and not limiting our consideration of costs to just those borne by a subset of producers or consumers. Additionally, drawing on results presented in the 2011 RIA, the EPA examined potential impacts on owners of coal mines and their employees via assessing changes to coal production, prices, and employment that might be attributable to the MATS rule. These analyses projected a 1 percent decrease in coal production, a 3 percent average increase in the minemouth price of coal, a 2 percent average increase in the delivered price of coal, and a loss of about 430 job years as the result of the rule in 2015.[79] [80] We consider these national-level impact projections to be relatively small and, as we have demonstrated that the 2011 RIA likely significantly overestimated the compliance costs of the rule. However, as explained above, the EPA believes it is important in this rulemaking to take a broad view of the potential impacts of MATS and not simply focus on impacts to owners of coal- and oil-fired generation. This approach is consistent with EPA evaluations of other power sector rules.

2. The EPA Cost Analyses Fail To Account for Localized Costs and Disproportionate Effects

Comment: Several commenters asserted that the EPA's cost estimates in the proposed rule do not include costs for units which were forced to make the decision to shut down due to MATS. Commenters argue that MATS caused significant coal-fired EGU retirements and said that the regulation, not low natural gas prices, caused a surge in coal-fired EGU retirements that has disadvantaged the coal mining industry. These commenters said that unit shutdowns cause very significant costs to owners and the community and that shutdown costs can include loss of unrecovered capital, loss of salary and benefits to employees, loss of tax dollars to the locality, cost of replacement generation, as well as other costs. These commenters concluded that the EPA's industry-wide cost accounting methods do not weigh specific localized costs and disadvantages that accompany CAA section 112 requirements. These commenters said that the EPA should not consider shutdowns as no-cost emission reductions and that the EPA's cost estimates should more fully reflect impacts on individual coal plants and communities that are uniquely dependent on those plants.

Response: As explained in more detail below, the EPA did consider employment impacts both in its 2011 RIA and in this action. There is no reliable way, however, of attributing local employment impacts to MATS regulation (any more than other concurrent changes which might have affected local employment levels), and

[79] Note the projected price of coal in the 2011 RIA increased because the rule was expected to shift some coal demand toward more expensive types of coal.

[80] Numbers of job years are not the same as numbers of individual jobs, but represents the amount of work that can be performed by the equivalent of one full-time individual for a year (or FTE).

the commenters do not provide any relevant data or method of analysis for the EPA to consider. According to the employment impacts analysis in the 2011 RIA, the *ex ante* projected impacts of MATS on aggregate employment levels were ambiguous as to whether the net impacts were positive or negative. That said, the EPA did consider such impacts in this final action.

As a general matter, employment impacts of major environmental regulations are likely to be composed of a mix of potential declines and gains across occupations, regions, and industries which are governed by broader labor market conditions. Isolating such impacts is a challenge, as they are difficult to disentangle from employment impacts caused by a wide variety of ongoing, concurrent economic changes. The economics literature illustrates some of the challenges for empirical estimation of facility- or location-specific employment: for example, there is a paucity of publicly available data on plant-level employment, thus most studies must rely on confidential plant-level employment data from the U.S. Census Bureau, typically combined with pollution abatement expenditure data, that are too dated to be reliably informative, or other measures of the stringency of regulation. These challenges are primarily associated with retrospective, or *ex post,* examinations of employment impacts of regulation. The challenges may be more pronounced when projecting impacts on a prospective, or *ex ante,* basis as the analysis would have to anticipate complex interrelated responses of many directly and indirectly affected entities across several industries.

The 2011 RIA provides what the EPA viewed as the most empirically tractable *ex ante* analysis of potential employment impacts of the MATS regulation. This analysis was composed of national-level estimates of employment changes for the regulated sector and pollution control sector, including estimates of employment impacts for the natural gas and coal production sectors from changes in EGU fuel demand. While the EPA projected employment losses due to incremental retirements of coal-fired EGUs and coal production activities, the EPA also projected gains in employment in pollution control-related activities, as well as natural gas production. More detail on these estimates follows.

The 2011 MATS RIA presented the EPA's estimates of employment impacts resulting from projected increase in demand for the design and construction of pollution controls. These results indicated that MATS could support or create roughly 46,000 one-time job-years of direct labor driven by the need to design and build the pollution controls. These labor categories included boilermakers, engineers, and general construction labor. In addition to the employment impacts estimated for the pollution control sector, the 2011 RIA projected changes in labor requirements resulting from the need to operate pollution controls, the increased demand for materials used in pollution control operation, shifts in demand for fuel in response to the rule, changes in employment resulting from additional coal retirements, and changes in other industries due to changes in the price of electricity and natural gas. The 2011 RIA presented an estimated increase of 3,890 job-years needed to supply inputs for pollution control equipment such as lime for FGD, activated carbon for activated carbon injection, trona for DSI, and baghouse material for fabric filters. The 2011 RIA projected decreases of 4,320 job-years due to retirements of existing coal capacity and a decrease of 430 job-years due to changes in coal demand. Lastly, the 2011 RIA projected an increase natural gas labor requirements of 670 job-years.

The 2011 RIA noted that the EPA provided estimates of some but not all potential employment impacts of MATS. The most notable of those that the EPA is unable to estimate are the impacts on employment as a result of the increase in electricity and other energy prices in the economy. The EPA said in the 2011 RIA that, in the case of MATS, labor may be a complement or a substitute to electricity in production, depending on the sector. The 2011 RIA also noted that environmental regulation may increase labor productivity by improving health. The EPA also was not able to quantify all potential employment changes in industries that support and supply the pollution control industry. Because of this inability to estimate all the important employment impacts, the EPA stated it neither summed the impacts that the EPA was able to estimate nor made any inferences of whether there is a net gain or loss of employment in the aggregate.

As noted in the 2022 Proposal, based upon contemporaneous market and technological conditions, the power sector modeling that supported the 2011 RIA anticipated natural gas prices that were approximately 82 percent higher than the level to which they fell in the 2015–2019 period. But, as explained in the Cost TSD of the 2022 Proposal, there are inherent limits to what can be predicted *ex ante.* The cost estimates were made 5 years prior to full compliance with MATS; stakeholders, including a leading power sector trade association, have indicated that our initial cost projection significantly overestimated actual costs expended by industry for compliance with MATS, likely by a figure in the billions of dollars per year. This results in part because of significant changes in the power sector outside of the realm of EPA regulation; there were dramatic shifts in the cost of natural gas and renewables, state policies, and Federal tax incentives which have also further encouraged construction of new renewables. These shifts have led to significantly more retirements of coal capacity and coal-fired generation than projected in the 2011 RIA's baseline. Given these findings, any incremental localized coal production sector and coal-fired EGU sector impacts the EPA could have reasonably anticipated as directly attributable to MATS are likely far fewer than those the commenters claim. No specific examples of localized adverse impacts that are directly attributable to the MATS regulation are provided by the commenters, nor are specific additional data or analytical approaches for the EPA to identify and consider what might be highly localized impacts of the broad types that the commenters describe. While the 2011 RIA-projected gains and losses are small relative to the size of the relevant energy sectors, based upon the conclusion that the 2011 RIA likely significantly overestimated the compliance costs, it is reasonable to conclude that the projected employment impacts, both positive and negative, in the 2011 RIA were also overestimated and likely relatively small.

The 2011 RIA economic analysis also accounted for the ability of displaced workers to obtain new employment which would mitigate employment impacts resulting from MATS. The cost analysis in the 2011 RIA accounts for the expectation that workers must be paid a prevailing wage in order to work because they have other employment opportunities or alternative uses for their time. For example, the EPA's estimated cost of pollution controls is, in part, based on the need to encourage workers to shift their employment to pollution control activities rather than other available options. Similarly, the EPA's estimates of fuel costs account for the wages workers demand for their time to produce those fuels (rather than, say, hold a different job). In the example of reductions in fuel use, such that workers may be displaced, the cost estimate in the 2011 RIA accounts for

the reduced expenditures on fuels because, in part, those workers have other employment options as reflected in the wage they receive. That said, in the case of highly concentrated reductions in the demand for workers in what may be undiversified local or regional economies, workers may not easily find other options at the otherwise prevailing wage (*i.e.,* with many local workers seeking new opportunities at once). However, the EPA's analysis in the 2011 MATS RIA did not project highly localized impacts, and, as noted in the 2022 Proposal, independent peer-reviewed studies confirm that other market circumstances, such as the increase in natural gas supplies, and not MATS or other environmental regulations, were primarily responsible for driving changes in the EGU sector after MATS was promulgated.

Indeed, CAA section 112(n)(1) does not specify how the EPA should consider employment impacts of EGU HAP regulation. The EPA therefore determined to consider employment impacts as part of its broader sector-wide cost inquiry. The EPA notes, however, that beyond the direction from the Supreme Court to reasonably examine the costs of regulation at the EPA's discretion, the studies required under CAA section 112(n)(1) do not require EPA to examine employment impacts, much less highly localized employment impacts, which is in contrast to other specific impacts the EPA is directed to consider under the statutory provision, *e.g.,* considering threshold levels of mercury concentrations in fish tissue consumed by sensitive populations pursuant to CAA section 112(n)(1)(C). Nonetheless, the EPA has taken such impacts into consideration in this final action in determining it is appropriate and necessary to regulate EGU HAP under CAA section 112.

Also, contrary to what is asserted by the commenter, the EPA's analysis does consider the costs of closures, and the costs of any emissions reductions resulting from a projected retirement are appropriately accounted for. The power sector modeling used in the 2011 RIA provides a forecast of least-cost capacity expansion, electricity dispatch, and emission control strategies while meeting electricity demand and various environmental, transmission, dispatch, and reliability constraints. The compliance cost estimate drawn from the 2011 RIA accounts for the cost of replacement generation and capacity when other capacity is withdrawn from service.

Comment: Commenters asserted that the EPA's totality-of-the-circumstances methodology likely understated the impact on utility services for lower-income populations. The commenters noted that MATS compliance costs required their utility to increase retail electricity rates by approximately 10 percent over 20 years. They noted that this is a significant added burden to the 20 percent of the utility's customers that fall below the poverty line. The commenters suggested that similar rate impacts from MATS compliance will likely affect lower income utility customers throughout the country. The commenters concluded that regardless of whether high-level, industry-wide impacts can be considered ''relatively small,'' personal impacts for many lower income utility customers were much greater and were not factored into the EPA's proposed totality-of-the-circumstances methodology.

Response: With respect to retail electricity prices, the EPA reiterates our finding from the 2022 Proposal that changes in inflation-adjusted national average retail electricity prices were within the range of normal year-to-year variability and decreased by nearly 7 percent during the period when MATS was implemented. This finding was made in support of the EPA's comprehensive analysis of costs of regulation, which is informed by the types of information the EPA is required to consider under CAA section 112(n)(1). The EPA further notes that the EPA's analysis of potential retail electricity price impacts was appropriately conducted at a regional level and reflects average price impacts. This analysis did not consider the state and Federal programs that exist for the purpose of reducing retail electricity prices at low-income households (*e.g.,* the Low Income Home Energy Assistance Program). Furthermore, the 10 percent rate increase noted by the commenters is within the range of annual variability in the 2001–2011 period. State-level data from the EIA demonstrates that in the 10 years preceding the implementation of MATS, the change over time in inflation-adjusted state electricity rates ranged from −25.3 percent to 29.7 percent, with an average of 0.8 percent.[81] In the 10 years following MATS promulgation, inflation-adjusted changes over time (and representing all cost drivers, not just MATS) ranged from −20.2 percent to 15.8 percent with an average of −0.3 percent.

3. The EPA Should Strengthen the 2022 Proposal by Updating the 2011 RIA Compliance Cost Estimates

Comment: Commenters supported the EPA's retrospective review of MATS cost data and cited studies finding actual costs of complying with air pollution regulations are often substantially lower than pre-compliance estimates. Commenters said that actual costs of the MATS rule are much lower than originally anticipated and cited the 2011 BCA estimate ($9.6 billion) as compared to several recent studies. Commenters said that compliance costs were likely lower than the EPA projected in 2011 due to market factors like lower natural gas prices and renewable energy costs that drove many retirements (rather than MATS), eliminating compliance costs originally projected for the retired units. Commenters said that these favorable market factors also reduced the costs of replacement generation that was needed due to compliance with the rule.

Several commenters who supported restoration of the Administrator's finding that it is appropriate and necessary to regulate HAP emissions from MATS-affected EGUs said that the EPA should consider strengthening the 2022 Proposal by updating the 2011 RIA using current data on costs (and benefits). These commenters concluded that the 2011 RIA overestimated costs compared to the actual costs incurred during MATS implementation. They asserted that the EPA's failure to update the cost estimates in the record is problematic given the Supreme Court's emphasis on weighing costs in *Michigan* v. *EPA.* In the view of these commenters, the EPA need not necessarily perform a new BCA, but should add information that is in the record. Commenters said that the EPA's proposed totality-of-the-circumstances approach does not provide the best cost estimates implicitly required in *Michigan* v. *EPA.* Additionally, these commenters opposed the EPA's ongoing reliance on the 2011 BCA because the 2011 BCA considered only 2015 costs and stated that the current proposal should consider those 2015 capital costs as sunk costs. They said the relevant costs for this proposal are mostly costs of operating control devices.

Response: The EPA agrees with the commenters that the 2011 RIA likely significantly overestimated the compliance costs of MATS. Section III.B of the 2022 Proposal presented a suite of qualitative and quantitative analysis of the cost assumptions used in the 2011

[81] U.S. Energy Information Administration *Annual Electric Power Industry Report, Form EIA–861 detailed data files,* October 2022.

RIA power sector modeling and the resulting projection. These evaluations indicated that the projected costs in the 2011 RIA were likely significantly overestimated. We found that the 2011 RIA's estimate of the number of installations alone led to an overestimate of about $2.2 to $4.4 billion, and that if recent updates to the cost and performance assumption for pollution controls had been reflected in the 2011 RIA modeling, the projected compliance costs would likely have been even lower. As we note above, even though the projected costs we use in this analysis are likely significantly overestimated, we find that they are still relatively small when placed in the context of the economics of the industry and well within historical variations.

As noted in the proposal, while the EPA considers that the information that was available at the time of MATS promulgation provided a valid analytical basis for the threshold appropriate and necessary determination, because many years have elapsed since then, the EPA believes it is reasonable to examine how the power sector has evolved since MATS was finalized and, with the benefit of hindsight, compare important aspects of the 2011 RIA projections with what actually happened since MATS was promulgated. Despite the commenter's assertion, it is necessary for that examination to include both the capital (sunk or otherwise) as well as operating costs of pollution controls in the EPA's consideration of cost, because that is consistent with the EPA's consideration of compliance costs at the time of promulgation.

As is explained in section III.B of the 2022 Proposal, there are significant technical challenges to producing rigorous retrospective estimates of regulatory costs, particularly for a rule like MATS which regulates hundreds of units within a complex, interdependent, and dynamic economic sector. However, as commenters have noted, the record is clear that the 2011 MATS RIA overestimated costs which further supports the determination that regulation is appropriate and necessary after considering cost.

C. Comments on Revocation of the 2020 Final Action

1. The EPA's Action in 2020 Was a Correct Response to Michigan

Comment: Commenters stated that the 2020 Final Action's finding that it is not ''appropriate and necessary'' to regulate HAP emissions should remain in place because it meaningfully compared the cost of compliance against the benefits of reducing HAP via regulation, consistent with the Supreme Court's decision in *Michigan* v. *EPA.* Commenters said that in *Michigan,* the Court held that the EPA had an obligation to adequately consider costs when making regulatory decisions. According to the commenters, although *Michigan* concluded that agencies have discretion about how to account for costs, that discretionary decision still must give sufficient weight to cost as a centrally relevant factor and must be within the limits of reasonable interpretation. However, commenters claim that in the 2016 Supplemental Finding, the EPA concluded that the rule's costs were reasonable and that there were significant benefits to public health and to the environment, but the EPA did not compare costs to benefits. The commenters said that the EPA's alternative BCA approach relied heavily on co-benefits as opposed to direct benefits and did not meaningfully consider cost. Commenters contend that in the 2020 Final Action, the EPA used a more limited, proper definition of ''benefits'' that did not give significant weight to co-benefits. Commenters stated that the 2020 Final Action relied on a focused examination of the relevant costs compared to the benefits associated with regulating HAP emissions, finding that the benefits were not substantial enough for the regulation to be justified overwhelmingly; and that because monetized costs of regulation exceeded monetized benefits by three orders of magnitude, unquantified HAP benefits did not alter the outcome of that cost-benefit comparison, and practically all the monetized benefits of regulation were derived from non-HAP co-benefits. According to the commenters, the EPA was also right not to disproportionately load the analysis with unquantified and nonmonetized effects felt only by isolated communities or within only narrow pockets of potentially affected persons. The comments stated that by using a more traditional approach to the cost-benefit analysis focusing on the HAP regulated by CAA section 112 in the 2020 Final Action, the EPA was better able to consider the appropriate factors in determining whether it was appropriate and necessary to regulate. The 2020 Final Action finding that it is not ''appropriate and necessary'' to regulate HAP emissions treats power plants differently from other stationary sources the way Congress intended under the CAA, according to the commenters.

Commenters also stated that retaining the 2020 Final Action eliminates risks of regulating pollutants under CAA section 112 of the CAA that are already covered elsewhere in the CAA, and risks of increased power rates with potentially little public health benefit.

Response: As explained further in section III.C above, the EPA found that the framework used to consider cost in the 2020 Final Rule, which centered the EPA's mandated determination under CAA section 112(n)(1)(A) on a comparison of costs solely to those HAP-reduction benefits which could be monetized, was ill-suited to making the appropriate and necessary determination in the context of CAA section 112(n)(1)(A) specifically, and the CAA section 112 program generally. Moreover, neither the statutory text nor legislative history of CAA section 112, nor the *Michigan* decision support a conclusion that the 2020 framework is required under CAA section 112(n)(1)(A), and the EPA has determined to adopt a different, more reasonable approach to considering costs in this context.

The EPA also disagrees with the conclusions presented in the 2020 Final Action as to the 2016 Supplemental Finding's two approaches, and the commenters' related contention that the EPA did not compare costs to benefits in the 2016 Supplemental Finding. As the EPA explained in the 2015 Proposal, and in this rulemaking, the record demonstrates that the EPA thoroughly considered compliance costs, and weighed them with the identified risks posed by HAP emissions from power plants. See section III.C of the 2022 Proposal.

The EPA further disagrees with commenters' characterization of the 2020 Final Action's determination of benefits. As discussed further in section III.C above, the 2020 Final Action failed to consider unquantified benefits of regulating HAP from EGUs sufficiently by relegating such benefits to the second step of the three-step framework employed by the 2020 Final Action, and summarily determining that unquantified benefits, even if monetized, were unlikely to alter the conclusion under the first part of the framework. However, the 2020 Final Action recognized that the monetized value of benefits represented but a small subset of the advantages of regulation. *See* 85 FR 31302 (May 22, 2020); *cf. Whitman* v. *Am. Trucking Ass'ns,* 531 U.S. 457 (2001) (holding that the EPA was not permitted to ignore information ''because the . . . benefits are difficult, if not impossible, to quantify reliably and because there is 'no convincing basis for concluding that any such effects . . . would be significant' ''); *Pub. Citizen* v. *Fed. Motor Carrier Safety*

Admin., 374 F.3d 1209, 1219 (D.C. Cir. 2004) (''The mere fact that the magnitude of . . . effects is uncertain is no justification for disregarding the effect entirely.'').

In addition, the EPA believes that the 2020 Final Action erred in not giving significant weight to the analysis with unquantified and nonmonetized effects felt only by isolated communities or within only narrow pockets of potentially affected persons. As noted in section II.A above, Congress directed the EPA to establish threshold levels of exposure under which no adverse effect to human health would be expected to occur, even considering exposures of sensitive populations, and throughout CAA section 112, Congress placed special emphasis on regulating HAP from sources to levels that would be protective of those individuals most exposed to HAP emissions and most sensitive to those exposures. Similar to the 2020 Final Action's dismissal of unmonetized benefits, the prior action ignored impacts to sensitive populations.

Moreover, the EPA disagrees with commenters' claim that the 2020 Final Action was better able to consider the appropriate factors in determining whether it was appropriate and necessary to regulate under CAA section 112. While the EPA agrees that a comparison of benefits to costs is a traditional way to assess costs, as explained in section III.C above, the 2020 framework was not a formal BCA, as there is no economic theory or guidance that the EPA is aware of that endorses the analysis used in the 2020 Final Action. Further, the EPA did not point to anything in the CAA to support the three-step framework that was utilized in the 2020 Final Action.

As commenters noted, the EPA's alternative approach, which applied a formal BCA, in the 2016 Supplemental Finding did consider the non-HAP emissions reduction benefits of regulating EGU HAP, which the EPA determined should be included in a formal BCA approach as such practice is required by widely-accepted economic principles, is contained in executive branch guidance, and applying a formal BCA for the appropriate and necessary determination is consistent with long-standing EPA practice, the statute, and legislative history. However, the EPA's preferred approach in the 2016 Supplemental Finding determined it was appropriate and necessary to regulate EGU HAP regardless of the benefits of reducing non-HAP emissions. We reaffirm that determination here.

Comments regarding the risk of regulating pollutants under section 112 of the CAA that are covered elsewhere in the Act are addressed in section 4.1 of the 2023 RTC Document.

2. Regulatory Certainty, Rate Recovery Issues, and Reliance Interests Weigh in Favor of the EPA's Revocation of the 2020 Action

Comment: Commenters from the electric utility industry stated that the EPA should finalize the 2022 Proposal to provide regulatory and business certainty and ensure that investments undertaken to comply with MATS will not be jeopardized. Commenters said that air emissions data from the utility sector show vast reductions in HAP emissions over the last decade, and MATS compliance is a significant contributor to this result. According to the commenters, these achievements have not been without expense to generators and end users. Electric utility commenters noted that owners and operators of coal- and oil-fired EGUs made substantial investments to comply with MATS; the industry has spent upwards of $18 billion since 2012 in capital costs and operations and maintenance costs for various types of control technologies to comply with MATS. Commenters said that owners and operators have also invested in the retirement of older, more costly, and less efficient generating assets (mostly coal-fired) and the shifting of generation to new, cleaner, replacement generation. As a result, commenters explained that over the last decade, the U.S. electricity generation resource mix has changed significantly, in part due to MATS compliance. Commenters said that at this point, the electric utility industry has fully implemented MATS and EGUs have been in continuous compliance with MATS for many years. The capital costs invested to comply with MATS are sunk, these commenters pointed out, but now that these capital expenditures are complete, sources are realizing the value of their investments and anticipate doing so in the future.

Commenters also stated that owners and operators have made business decisions based on the assumption that MATS will remain in place. For example, according to the commenters, EGUs that generate power in wholesale electricity markets have factored continued operation of their pollution controls into bids for those markets. Commenters said that moreover, many investor-owned electric companies are subject to rate reviews by state Public Utility Commissions regarding recovery of their MATS-associated costs. Commenters stated that numerous utilities rely upon the mandated status of MATS in order to recoup expenditures already made to comply with the rule before Public Utility Commission proceedings. According to the commenters, even many industry members not directly regulated by MATS made significant investment decisions in reliance on MATS and the ''appropriate and necessary'' findings, because the costs associated with compliance decisions by the EGUs subject to MATS can influence the dispatch of electricity generated by EGUs that are not regulated by the MATS rule. Commenters said that in fact, compliance decisions can affect wholesale power prices, fuel prices, and dispatch order, and the entire industry made changes to respond to those effects, and in anticipation of those effects.

Other industry commenters stated that the 2020 Final Action reversing the 2016 Supplemental Finding created regulatory uncertainty and litigation risk by weakening the legal underpinnings of the MATS rule with no immediate corresponding regulatory benefits. According to the commenters, this action rendered the MATS rule vulnerable to legal challenges, thereby creating significant financial uncertainty for the electric generating industry. The commenters noted that companies began undertaking efforts to comply with the MATS rule after its promulgation in 2012 and have been in compliance for several years. The commenters stated that these companies already have invested the necessary capital to install controls or made changes to operations at their plants to ensure compliance with the MATS rule. Many companies complying with the MATS rule are subject to ongoing rate reviews regarding recovery of costs associated with complying and removing the legal basis for the MATS rule has made recovery for the costs of MATS compliance uncertain, according to the commenters. Commenters stated that while it may be intuitive that controls that were legally required at the time they were installed are justified, rescinding MATS at this time would provide unnecessary fodder for unreasonable arguments against such cost recovery. Even if companies were to ultimately prevail in challenges to rate recovery for these costs, such challenges would be costly and time intensive, according to the commenters. Commenters noted that these investments were made in reliance on the EPA's prior rulemakings.

Commenters also stated that regulatory certainty is essential to municipalities and cities as well as

power companies for future planning. Commenters said that cities and municipalities are committed to the transition to cleaner energy. According to the commenters, concurrent with this transition, electric companies, public power utilities, and electric cooperatives are making significant investments to make the energy grid smarter, cleaner, more dynamic, more flexible, and more secure in order to integrate and deliver balanced mix of central and distributed energy resources reliably and provide resilient electricity to customers. Commenters noted that many companies have set carbon goals and are retiring their coal-fired units, converting to other fuel sources, and expanding generation from renewable sources. Commenters stated that renewable energy projects require financial investment, asset procurement, and permitting, and commissioning clean energy requires time and money. According to the commenters, companies are relying on baseload power from units subject to the MATS rule to support the transition to renewable sources, and account for this power in their long-term planning for the development of new generating assets. Commenters stated that accordingly, certainty around the regulatory requirements that apply to these coal-fired units is important to forecast the lifespans and availability of these units. These commenters explained that if public power utilities must contend with unanticipated new environmental projects for MATS, resources may need to be diverted away from renewable projects to address new MATS-related environmental projects. Commenters noted that public power has fully implemented MATS and has relied on previous investments to reduce HAP in planning for future energy transitions. Therefore, regulatory certainty is critical to ensuring future plans can be sustained to transition to a cleaner energy future, according to the commenters. These commenters claimed that failure to finalize the 2022 Proposal and leaving the MATS rule vulnerable to legal challenge would add unnecessary complexity to companies' clean energy transition plans that already are underway and undermine the progress that has been made to date. Commenters stated that restoring the appropriate and necessary determination enables electric companies to remain focused on getting the energy provided as clean as possible and as fast as possible, while maintaining the reliability and affordability that customers value.

Commenters from several states and environmental organizations stated that the EPA was right to consider reliance interests as part of the ''appropriate and necessary'' finding and noted that consideration of those reliance interests supports retaining the finding. Commenters averred that the EPA's 2020 Final Action did not consider these substantial reliance interests and was thus arbitrary and capricious. Commenters asserted that 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). Commenters stated that the EPA was aware that there were concerns among stakeholders that MATS could be rescinded based on the 2020 Final Action, so rather than dismissing any threat to the standards, the EPA should have accounted for harms to the reliance interests related to MATS. These commenters claimed that the EPA failed to do so in the 2020 Final Action. In particular, according to the commenters, the EPA 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 the 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, according to the commenters.

Commenters stated that legal challenges to the MATS rule will continue to occur if the 2020 Final Action remains in effect. In the 2019 Proposal, the EPA specifically solicited comment on the theory that MATS may—or even must—be rescinded if the EPA reversed the ''appropriate and necessary'' determination because such a determination is a statutory prerequisite to the EPA's authority to promulgate an EGU regulation under CAA section 112(d). Commenters stated that in the end, the EPA concluded in the 2020 Final Action that regulation was necessary but ''not appropriate'' and also decided that EGUs would remain listed under CAA section 112(c)(1), since they can only be delisted through the CAA section 112(c)(9) delisting process, but it remained unclear whether the EPA would have authority to promulgate regulations governing EGUs given the absence of the predicate appropriate and necessary determination. Commenters said that while the EPA did not rescind the MATS in the 2020 Final Action, other stakeholders predicted or indicated that there would be challenges to the EPA's decision not to rescind MATS, possibly leading to a court mandated rescission of the standards. Commenters noted that indeed, the very day that the 2020 Final Action was published in the **Federal Register**, Westmoreland Mining Holdings LLC petitioned for review of the 2020 Final Action on grounds that upon concluding regulation was ''not appropriate'' within the meaning of CAA section 112(n)(1), the EPA was required to rescind MATS (*Westmoreland Mining Holdings LLC* v. *EPA,* No. 20–1160 (D.C. Cir.)). According to the commenters, by overlooking the risk that the 2020 Final Action would lead to litigation challenging MATS itself, the 2020 Final Action harmed the interests of members of the public who rely on the standards' public health and environmental protections, and the interests of states that depend on MATS to preserve the economic value of their fisheries and to facilitate compliance with other pollution-control requirements.

The EPA did not receive comments that claimed reliance interests in support of maintaining the 2020 Final Action.

Response: The EPA acknowledges the many commenters, including several electric utility industry groups representing investor-owned electric companies, rural electric cooperatives, community-owned utilities, and electric distribution companies, who wrote in support of the 2022 Proposal based on reliance interests, because it provides regulatory and business certainty, and because it ensures industry investments to comply with MATS are not jeopardized.

As discussed in section III.D above, the EPA acknowledges that during prior rulemaking processes related to the appropriate and necessary determination, stakeholders raised related concerns that undermining the threshold finding in order to pave the way to rescinding MATS would have grave economic and health consequences. Utilities reported that they rely upon the mandated status of MATS in order to recoup expenditures already made to comply with the rule before Public Utility Commission proceedings. States asserted that they rely upon the Federal protections achieved by the rule in state

implementation planning and other regulatory efforts. And other industries, such as pollution control companies, have made business decisions based on the existence of MATS. The EPA agrees with commenters here and from prior rulemaking processes that nearly all reliance interests are aligned and weigh in favor of retaining the appropriate and necessary determination, particularly given the significant portion of compliance costs that have already been spent.

The EPA additionally agrees with environmental commenters that the 2020 Final Action failed to appropriately consider reliance interests, which commenters have raised here and which were similarly raised in comments in response to the 2019 Proposal. As noted by commenters, agencies must ''assess whether there [a]re reliance interests, determine whether they [a]re significant, and weigh any such interests against competing policy concerns[ ]'' when changing regulatory policy. *Dep't of Homeland Sec.* v. *Regents of the Univ. of Cal.,* 140 S. Ct. 1891, 1915 (2020). Although the 2020 Final Action briefly addressed comments as to reliance interests of maintaining the MATS regulation and reducing regulatory uncertainty by claiming the action did not affect reliance interests because it did not rescind the MATS regulation, the 2020 Final Action failed to address the uncertainty that was created for industry and others by rescinding the appropriate and necessary finding. Indeed, the EPA further agrees with environmental commenters who note that the 2020 Final Action contributed to greater regulatory uncertainty because it led to challenges to the underlying MATS regulation, which were consolidated in *Westmoreland Mining Holdings LLC* v. *EPA,* No. 20–1160 (D.C. Cir.), and which created uncertainty for the many stakeholders who cite reliance interests in favor of keeping the MATS regulation in place. While such reliance interests are not integral to the EPA's conclusion to revoke the 2020 Final Action, they nonetheless weigh in favor of doing so.

D. Comments on the Administrator's Preferred Framework and Conclusion

1. The EPA's Totality-of-the-Circumstances Approach Is Consistent With Michigan and Shows That Regulation of U.S. EGU HAP Emissions Is Appropriate and Necessary

Comment: Commenters stated that the EPA's totality-of-the-circumstances approach is faithful to the CAA's text and purpose, and abundant record evidence supports the EPA's determination that regulation of power plant HAP emissions remains appropriate and necessary. According to the commenters, the approach is consonant with the Supreme Court's holding in *Michigan* that the term ''appropriate'' encompasses all of the advantages and disadvantages of regulation. Commenters stated that *Michigan* confirmed that the statute does not require the EPA to consider costs in a particular way, and it does not require the EPA to use a formal BCA or attempt to monetize every cost and benefit. Rather, in the view of commenters, *Michigan* expressly recognizes that it is ''up to the Agency (as always, within the limits of reasonable interpretation) how to account for cost.'' *Michigan,* 576 U.S. at 759. Commenters asserted that in the proposed totality-of-the-circumstances approach, the EPA carefully considered and weighed all statutorily relevant factors to determine whether to regulate HAP from power plants, including ''account[ing] for cost.''

Commenters explained that as a first step, consistent with Congress' focus on public health in CAA section 112(n)(1)(A), the EPA considered the human health advantages, in particular the direct health effects, quantified as well as unquantified, of regulating HAP from power plants. Commenters stated that in amending CAA section 112 in 1990, Congress recognized that some benefits of regulation—such as reducing ''the public health consequences of substances which express their toxic potential only after long periods of chronic exposure''—are not readily captured in monetary terms and ''will not be given sufficient weight in the regulatory process when they must be balanced against the present-day costs of pollution control and its other economic consequences.'' S. Rep. No. 101–228 at 182 (1989), reprinted in Legis. History of the Clean Air Act Amendments of 1990. Commenters said that the language and context of CAA section 112's appropriate and necessary determination indicate that the EPA ought to account for the many relevant potential benefits of HAP regulation when making the finding.

Commenters stated that the EPA appropriately considered 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, the environmental benefits to society of regulating HAP emissions from power plants, and the overall volume of emissions of HAP from power plants. According to the commenters, the EPA then carefully considered, 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. Finally, the commenters said, the EPA proposed 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 after weighing the totality of the circumstances, regulation of HAP from power plants is appropriate. In the view of commenters, the EPA's totality-of-the-circumstances approach to the CAA section 112(n)(1)(A) determination is rationally related to the goals of the statute and is the best effectuation of Congress' intent.

Commenters supported the EPA's decision under a totality-of-the-circumstances approach to prioritize all of the public health benefits of regulating HAP from power plants, whether capable of quantification or not, in line with Congress' clear intent (87 FR 7637). According to the commenters, while Congress did not define the precise methodology that the EPA is to employ when making an appropriate and necessary determination in CAA section 112(n)(1)(A), it clearly communicated that the EPA should focus on the ''hazards to public health . . . as a result of emissions'' from power plants, explicitly directing the EPA to conduct a formal study on that issue to inform its determination. Commenters said that the other studies that Congress authorized the EPA to conduct in CAA section 112(n) further indicate Congress' intent that the EPA pay careful attention to the multiple insidious harms of hazardous air pollution from power plants; Congress directed the EPA to study and consider: the ''health and environmental effects of such emissions'' and the amount (''rate and mass'') of those emissions in CAA section 112(n)(1)(B); and the health risks of even low levels of mercury to sensitive populations in CAA section 112(n)(1)(C). According to commenters, section 112 of the CAA also reflects Congress' concern that HAP emissions may threaten disproportionate risks to those who are most vulnerable; CAA section 112(f)(2) directs the EPA to consider residual risk focusing on lifetime cancer risk to the ''individual most exposed'' as a regulatory trigger.

Commenters noted that other references in CAA section 112 highlight Congress' concern that the EPA exercise its CAA section 112 authority to address even small health and environmental risks posed by HAP (*e.g.,* CAA section 112(b)(3)(D)). Consistent with these congressional objectives, commenters explained that the EPA's totality-of-the-circumstances framework properly accounts for the benefits of HAP regulation that cannot be determined in precise monetary terms but are no less real than those that can be. The benefits—monetized and unmonetized—of regulating HAP emissions from power plants are substantial, according to commenters.

Commenters stated that the Supreme Court explained that '' '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)). Commenters asserted that it is thus eminently reasonable for the EPA to make the appropriate and necessary determination by balancing a broad swath of considerations that Congress has indicated are relevant to CAA section 112'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 County.* 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). Commenters noted that many 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.

Commenters stated that under the totality-of-the-circumstances framework, the record evidence available in 2012 alone is more than sufficient to support a finding that it is appropriate to regulate EGUs under CAA section 112. Commenters noted that at the time, the EPA acknowledged substantial quantified and unquantified HAP-reduction benefits, as well as non-HAP-reduction benefits that the EPA more completely monetized. According to the commenters, information that has become available since the 2011 RIA—including much larger estimates of the health effects of mercury emitted by EGUs, new evidence of the ecological impacts of mercury, compelling research on the health effects of toxic metals and metals mixtures, recent research on the health effects of acid gases, and recent assessments of the science on the health and environmental effects of PM and ozone—confirms the finding that it is appropriate to regulate EGUs' HAP emissions under CAA section 112. Commenters said that the unexpectedly large declines in these emissions since MATS was promulgated only amplify all these considerations. Moreover, the need to address the significant and disproportionate impacts on communities of color and low-income communities from EGU HAP emissions prior to MATS further supports the finding of appropriateness, according to the commenters. Commenters noted that meanwhile, lower natural gas prices, lower costs of pollution controls, and readily available, inexpensive renewable energy have all pushed compliance costs far below the EPA's original projections, which were overestimates even in 2011 based on certain assumptions about the pollution controls that would be needed to comply.

Commenters also stated that the EPA appropriately considered unquantified benefits and co-benefits as part of the totality-of-the-circumstances analysis and that doing so is consistent with other case law, executive guidance, and past EPA practice. Commenters said that the totality-of-the-circumstances approach recognizes that many benefits of reducing toxic air pollution exposure cannot be quantified but that does not mean that these benefits are small, insignificant, or nonexistent. Commenters stated that to argue that these benefits should not factor into whether a pollution control measure is appropriate and necessary because they cannot be quantified runs counter to the law, statutory text and design, and the Administration's stated EJ commitments. Indeed, according to the commenters, OMB's Circular A–4 has long cautioned agencies against ignoring unquantifiable benefits, because the most efficient rule may not have the largest quantified and monetized estimate. It instead directs agencies to consider values that are difficult or impossible to quantify, including equity, human dignity, fairness, and distributive impacts, according to the commenters.

Commenters stated that even for benefits where quantification is at least theoretically possible, the EPA accurately recognized that it can be extremely difficult and time-consuming to quantitatively estimate the manifold health and environmental benefits of reducing emissions of air toxics. Commenters noted that the harms of HAP are often concentrated, and more studies would be needed to monetize benefits such as reduced lifetime cancer risk or avoided reproductive harm in specific communities. Commenters stated that 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 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. For these and other reasons, commenters explained, the EPA is unable to quantify, let alone monetize, anywhere near the full scope of benefits that accrue from regulation of HAP from power plants, including the prevention of myriad health effects like cognitive impairment, cancer, and adverse reproductive effects. Commenters said that these quantification limitations present complications, but the complications do not mean the impacts can be ignored. According to the commenters, the EPA is correct, therefore, to carefully consider potential pathways for assessing their magnitude and scope, as well as to include robust qualitative discussion, to ultimately inform the appropriate and necessary determination. Commenters stated that because important uncertainties include not just the mechanisms of impact but also the extent to which specific populations may suffer, it is incumbent on the EPA to undertake this work to ensure the ensuing HAP protections achieve sufficient levels of protection—even when those levels cannot be absolutely quantified. 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, according to the commenters.

Commenters stated that while the appropriate and necessary finding is lawful and supported on the basis of direct benefits alone, the EPA also can and should consider co-benefits of the MATS rule, as was done here as part of the totality-of-the-circumstances framework. Commenters noted that the co-benefits of the MATS rule include massive health and environmental benefits due to reductions in PM and SO_2 pollution attributable to the MATS controls. Commenters said that multiple elements of the CAA's text and structure show that Congress intended that the EPA take a comprehensive view of regulation's advantages and disadvantages when evaluating its appropriateness, including the full scope of its benefits, according to the commenters. Notably, according to the commenters, CAA section 112(n)(1)(A)'s direction that the EPA assess how effectively control technologies targeting other pollutants, under other provisions of the CAA, were controlling HAP from power plants, demonstrates that Congress did not intend that the EPA take a blinkered view of benefits when regulating under CAA section 112. The commenters stated that is especially true where, as here, doing so would give no weight to reductions in PM and other pollutants that have led to massive public health benefits. Commenters noted that in addition, the Supreme Court stated in *Michigan* that the EPA has flexibility in how it evaluates costs and benefits when making the appropriate and necessary finding and specifically stated that ''an agency may not 'entirely fai[l] to consider an important aspect of the problem' when deciding whether regulation is appropriate.'' *Michigan* v. *EPA,* 576 U.S. 752 (2015) (quoting *Motor Vehicle Mfrs. Ass'n of U.S., Inc.* v. *State Farm Mut. Auto. Ins. Co.,* 463 U.S. 29, 43 (1983)). Commenters said that 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 of hazardous air pollutants.'' *U.S. Sugar Corp.* v. *EPA,* 830 F.3d 579, 623–25 (D.C. Cir. 2016) (in a case involving the HAP program under section 112 of the CAA, affirming the EPA's reliance on co-benefits, including ''reductions in emissions of other pollutants,'' to justify more stringent standards for HCl emissions from boilers, process heaters, and incinerators). The commenters said that non-HAP benefits that include preventing thousands of hospitalizations, thousands of heart attacks, and thousands of premature deaths every year (according to the 2011 RIA) surely count as an important aspect of the problem.

Response: For the reasons set forth in section III.D above, and discussed elsewhere in this preamble and the 2023 RTC Document, the EPA agrees with commenters that the EPA's preferred totality-of-the-circumstances approach is consistent with the Supreme Court's decision in *Michigan* and reasonably shows that it is appropriate and necessary to regulate EGU HAP emissions pursuant to CAA section 112. The EPA further agrees that its preferred approach is well suited to the appropriate and necessary finding given the wide array of considerations Congress has indicated are relevant to CAA section 112's goals, including public health, health impacts on the most vulnerable and exposed individuals, environmental effects, and costs, and to properly accounts for the benefits of HAP regulation that cannot be determined in precise monetary terms. Additionally, the EPA agrees with commenters that the EPA's preferred totality-of-the-circumstances approach appropriately considered unquantified benefits as part of the totality-of-the-circumstances analysis, and that such consideration of unquantified benefits is consistent with other case law, executive guidance, and past EPA practice when evaluating public health, equity, and other relevant considerations. The EPA also agrees with commenters that non-HAP emission reduction benefits are appropriate to consider under CAA section 112(n)(1)(A) as explained in section 4.1 of the EPA's 2023 RTC Document.

2. The EPA Failed To Conduct a Weighted Comparison of Costs vs. Benefits as Required by Michigan

Comment: Commenters stated that the totality-of-the-circumstances methodology does not properly consider the important costs related to regulation, nor does it treat those costs equally with the other factors that must be considered. Commenters said that the EPA's proposed approach to cost analysis merely evaluates whether the industry—or the public at large, since the costs of making a product are invariably passed on to customers and ratepayers—can afford the regulation. Commenters stated that in the 2022 Proposal, the EPA assessed compliance costs based on various metrics (*e.g.,* compliance costs as percent of power sector sales; compliance expenditures compared to power sector's annual expenditures; impact on retail price of electricity; impact on power sector generating capacity) that are unrelated and not compared to benefits. According to the commenters, the proper analysis is not whether the industry (or society at large) can afford the costs of compliance, but whether the costs of compliance are worth it based on the total benefits derived from regulation. In the view of commenters, under *Michigan,* the EPA cannot justify imposing new requirements on sources simply because it believes that the industry in question (or the American economy) could afford to foot the bill of increased regulation. Commenters noted that the utility sector is a large industry, and the American economy is the largest in the world. Commenters asserted that the EPA would be hard-pressed to find the American economy and the utility sector cannot afford the cost of virtually any regulatory action, especially when such action is viewed in isolation. That conclusion, however, does not mean the benefits of the regulation justify its costs, according to the commenters. Commenters said that in short, a benefit-cost framework requires a comparison of benefits and costs, not just affordability of the costs.

Commenters stated that in addition to mischaracterizing the costs and benefits, the 2022 Proposal also failed to compare the two. According to the commenters, in *Michigan,* the Court made clear that something more than just a general review of all available information is needed. Commenters said that the Court did not simply ask the EPA to list or describe both benefits and costs—an analysis is required to determine whether the benefits justify the costs, and the EPA must weigh them, one against the other. These commenters averred that *Michigan* follows other Supreme Court decisions affirming the principle that agencies, to act reasonably, must weigh the costs and benefits of actions (*Indus. Union Dep't, AFL–CIO* v. *API,* 448 U.S. 607, 645, 668 (1980); *Entergy Corp.* v. *Riverkeeper, Inc.,* 556 U.S. 208, 225–26, 232–33 (2009)). Further, these commenters argued that the comparison of costs and benefits is necessary for reasonable decision-making to occur. Commenters asserted that the 2022 Proposal indicates that the EPA weighed the costs and benefits, but it provides no further explanation as to how that weighing actually occurred, according to the commenters. For example, according to the commenters, the EPA did not explain why and how the non-monetized benefits of the action in particular outweighed the costs.

Commenters expressed that the 2022 Proposal stated that the EPA considers all of the advantages of reducing emissions of HAP regardless of whether those advantages can be quantified or monetized, and the EPA explained why almost none of those advantages can be monetized. However, even if benefits cannot be monetized, the EPA must evaluate and explain whether the specific benefits the EPA identified are worth the estimated cost, according to the commenters. Instead, commenters said that the EPA summarily stated that ''[a]fter considering and weighing all of these facts and circumstances . . . the Administrator proposes to conclude that the substantial benefits of reducing HAP from EGUs . . . are worth the costs'' (87 FR 7668). The commenters stated that other than conclusory statements claiming the asserted benefits ''outweigh'' costs, the EPA nowhere weighed anything at all. According to the commenters, the EPA is certainly correct that the Supreme Court in *Michigan* stopped short of requiring the EPA to conduct a ''formal cost-benefit analysis'' and deferred to the EPA's judgment on how to weigh costs and benefits. But the Court's recognition of the difficulty of the task did not sway its opinion that the EPA must weigh all, and only, the relevant factors in some reasonable fashion, in the view of commenters. The commenters said that a single sentence conclusion does not meet the standard set forth in *Michigan.*

Commenters stated that the EPA noted in the 2022 Proposal that available data and methods currently preclude a full and accurate quantitative accounting of the impacts of reducing HAP emissions from EGUs and a monetization of these impacts. Commenters agreed that MATS may have benefits beyond those that can be reduced to the strictly economic but stated that the challenge in assessing such benefits is profound. Therefore, it is most appropriate to rely on monetized benefits in an analysis of costs versus benefits for a regulation, as opposed to potential benefits for which value cannot be measured, according to the commenters. Even considering the EPA's proposed attempt to monetize the value society places on avoiding potential effects and the revised cost estimates, commenters stated that the disparity of costs versus benefits for this regulation is not compatible with a finding that regulation would be appropriate. Commenters said that in the absence of compelling and significant benefits from reductions in HAP from coal- and oil-fired EGUs, the costs of reducing HAP from these sources must be considered excessive.

Commenters stated that in the 2022 Proposal, the EPA considered the potential benefits of ancillary reductions of non-HAP such as SO_2, direct $PM_{2.5}$, and other $PM_{2.5}$ and ozone precursors because they are co-emitted with HAP and the controls necessary to reduce HAP emissions from EGUs often reduce these pollutants as well. However, those non-HAP emissions are also regulated under the Cross State Air Pollution Rule and Ozone Season NAAQS, according to the commenters. Commenters said that the benefits associated with such reductions should be considered alternatively and independently, not in support of a totality-of-the-circumstances approach under CAA section 112(n)(1)(A). In addition, according to the commenters, in applying the totality-of-the-circumstances methodology, the EPA stated that, in considering and weighing advantages to regulations against costs, the EPA would be ''giving particular weight'' to the examination of the public health hazards reasonably anticipated to occur as a result of HAP emissions from EGUs, and ''the risks posed by those emissions to exposed and vulnerable populations.'' According to the commenters, neither CAA section 112(n)(1)(A) nor the congressional findings and purposes stated in CAA section 101 justify giving ''particular weight'' as opposed to weight to the public health hazards from HAP emissions from EGUs in the calculation of advantages and disadvantages.

Other commenters said the EPA should conduct a formal cost-benefit analysis for the decision to impose regulations and make available to the public all the information that the EPA relied upon for that analysis. Commenters expressed that the EPA should also thoroughly articulate those costs and benefits related to HAP reductions and identify on the record the precise costs and benefits that can and cannot be monetized. Commenters stated that the EPA should clearly identify the basis, consideration, and weight given each variable in determining whether it is ''appropriate and necessary'' to regulate HAP emissions from EGUs. Both the ''cost reasonableness'' test put forward in the 2016 Supplemental Finding and the totality-of-the-circumstances test in the 2022 Proposal are inadequate, according to the commenters.

Response: The EPA disagrees with these commenters and, for reasons set forth in section III.D above, believes that the totality-of-the-circumstances methodology is fully consistent with the *Michigan* Court's ''expectation that the Agency should weigh benefits against costs.'' The EPA maintains that its preferred totality-of-the-circumstances approach, in which the Administrator weighs all of the advantages of regulation against all of its disadvantages to determine whether regulation is worth it, is a reasonable interpretation of CAA section 112(n)(1)(A)'s requirement to determine whether it is appropriate and necessary to regulate EGU HAP emissions under CAA section 112 and is consistent with the Supreme Court's decision in *Michigan* v. *EPA.* The Supreme Court instructed the EPA to determine a reasonable way to ''pay[ ] attention to the advantages and disadvantages of [our] decisions,'' *Michigan,* 576 U.S. at 753, in determining whether it is appropriate to regulate coal- and oil-fired EGUs under section 112 of the CAA. The Court held that a formal BCA is not required under the statute and concluded that the EPA has discretion to decide (within the limits of reasonable interpretation) how to consider cost. *Id.* at 759.

Under CAA section 112(n)(1)(A), Congress directed the EPA to regulate EGU HAP emissions after considering the results of the ''study of hazards to public health reasonably anticipated to occur as a result of emissions'' from such facilities. In CAA sections 112(n)(1)(B) and (C), Congress directed further studies to examine the health and environmental effects of EGU mercury emissions, and to examine threshold levels of mercury concentrations which may be consumed in fish tissue (including in sensitive populations) without adverse effects to public health. Accordingly, the EPA finds it is reasonable to conclude that, in addition to costs, the information from those studies is important and relevant to a determination of whether HAP emissions from EGUs should be regulated under CAA section 112. *See also Michigan,* 576 U.S. at 753–54 (citing CAA sections 112(n)(1)(B) and (C), its caption, and the additional studies required under those subparagraphs as relevant statutory context for the appropriate and necessary determination).

The EPA recognized that benefits like those associated with reduction of HAP can be difficult to monetize, and this incomplete quantitative characterization of the positive consequences can underestimate the monetary value of net benefits. This is well-established in the economic literature. As noted in OMB Circular A–4, ''[w]here all benefits and costs can be expressed as monetary units, BCA provides decision makers

with a clear indication of the most efficient alternative.'' Circular A–4 at 2. However, ''[w]hen important benefits and costs cannot be expressed in monetary units, BCA is less useful, and it can even be misleading, because the calculation of net benefits in such cases does not provide a full evaluation of all relevant benefits and costs.'' Circular A–4 at 10.

Weighing factors and circumstances surrounding potential regulation is an inherent aspect of agency decision-making, which necessarily requires tradeoffs and reasonable exercises of discretionary judgment. *See White Stallion,* 748 F.3d at 1266 (''All regulations involve tradeoffs, and . . . Congress has assigned EPA, not the courts, to make many discretionary calls to protect both our country's environment and its productive capacity.'') (Kavanaugh J., dissenting). Further, the D.C. Circuit held in *Catawba Cty.* v. *EPA* that ''[a]n agency is free to adopt a totality-of-the-circumstances test to implement a statute that confers broad authority, even if that test lacks a definite 'threshold' or 'clear line of demarcation to define an open-ended term.' '' 571 F.3d 20, 37 (D.C. Cir. 2009); *see also PDK Labs.* v. *DEA,* 438 F.3d 1184, 1194 (D.C. Cir. 2006) (''Agencies routinely employ multifactor standards when discharging their statutory duties, and we have never hesitated to uphold their decisions when adequately explained.'').

Exercising its discretion, and consistent with the statute and with past court decisions, the EPA determined its preferred totality-of-the-circumstances approach is particularly well suited to the CAA section 112(n)(1)(A) appropriate and necessary finding in part because the EPA is unable to quantify or monetize many of the effects associated with reducing HAP emissions from EGUs. Indeed, the D.C. Circuit has recognized that ''requiring EPA to wait until it can conclusively demonstrate that a particular effect is adverse to health before it acts is inconsistent with both the [Clean Air] Act's precautionary and preventive orientation and the nature of the Administrator's statutory responsibilities.'' *Lead Industries Ass'n* v. *EPA,* 647 F.2d 1130, 1155 (D.C. Cir. 1980).

Nor does the EPA agree with commenters that the EPA failed to compare in a meaningful way the benefits of this action against its costs, or that the 2022 Proposal did not provide an explanation of how this weighing actually occurred. The Supreme Court has said that a rule will be found to be arbitrary and capricious ''if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.'' *State Farm,* 463 U.S. at 43 (U.S. 1983). Further, an agency is required to give ''some definitional content'' to vague statutory terms by ''defining the criteria it is applying,'' because a refusal to do so is equivalent to ''simply saying no without explanation.'' *Pearson* v. *Shalala,* 164 F.3d 650, 660 (D.C. Cir. 1999). Here, the EPA has given meaning to its understanding of the appropriate and necessary determination by laying out all of the many factors and criteria that it considered based on a thorough examination of the statute in light of the *Michigan* decision.

The Administrator must exercise his judgment in deciding whether the disadvantages of regulation justify its advantages and the EPA need not demonstrate that his decision is the same decision that would be made by another Administrator or a reviewing court. An agency action need not be the only approach or even the approach that a reviewing court might find most reasonable. Instead, the test is ''whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment.'' *Citizens to Preserve Overton Park, Inc.* v. *Volpe,* 401 U.S. 402, 416 (U.S. 1971); *see also ExxonMobil Gas Mktg. Co.* v. *FERC,* 297 F.3d 1071, 1083–1084 (D.C. Cir. 2002) (''Accordingly, we will uphold the Commission's application of the test as long as it gives 'reasoned consideration to each of the pertinent factors' and articulates factual conclusions that are supported by substantial evidence in the record.'' (citation omitted)). Reasonable people, and different decision-makers, can arrive at different conclusions under the same statutory provision, but those conclusions must be reasonable under the statutory structure. The EPA does not agree with the commenters' positions that HAP emissions from EGUs do not pose significant hazards to public health and the environment and that the cost of compliance with MATS is unreasonable. This factual disagreement with the commenters does not render the EPA's statutory interpretation of how to consider cost and the Administrator's weighing of the relevant factors arbitrary. Absent clear direction from the statute and a demonstration that the Administrator has made a ''clear error of judgment,'' the EPA's interpretation and analysis should govern.

Moreover, contrary to commenters' assertions, the EPA did evaluate and explain in detail in section III.D above, why the EPA views the advantages of EGU HAP regulation as outweighing the disadvantages of doing so. Under the EPA's preferred approach, the EPA considered the advantages of EGU HAP reductions as informed by types of information the statute directed the EPA to consider under the studies required by CAA section 112(n)(1). In particular, the EPA considered the public health benefits of regulation pursuant to CAA section 112(n)(1)(A), and the EPA considered the rate and mass of EGU mercury emissions, the health and environmental effects of such emissions, and the threshold level of mercury concentrations in fish tissue which may be consumed (even by sensitive populations) without adverse effects to public health consistent with the studies required under CAA section 112(n)(1)(B) and (C). The EPA determined that the benefits of regulating EGU HAP emissions are great and doing so addresses serious risks to vulnerable populations that remained after implementation of the ARP and other controls on the power sector under the CAA. The EPA placed considerable weight on such benefits given the directive to do so in CAA section 112(n)(1)(A) and Congress' clear purpose in amending CAA section 112 in 1990. See section II of the 2022 Proposal.

The EPA also considered compliance costs in a comprehensive manner by placing such costs in the context of the effect those expenditures have on the economics of power generation more broadly, the reliability of electricity, and the cost of electricity to consumers. Similar to the EPA's evaluation of benefits, the EPA's comprehensive analysis of disadvantages and costs of regulation is informed by the types of information the EPA is required to consider under CAA section 112(n)(1). The EPA gave particular consideration to potential adverse impacts that could be felt by the public via increased electricity prices and reduced access to a reliable power supply but determined that EGU HAP regulation would not and has not caused such deleterious effects to the public. The EPA considered costs based on the record before the EPA at the time we issued the regulation and made the threshold determination in 2012, and based on new information, which suggests cost projections used in the 2016 Supplemental Finding likely

overestimated actual costs of compliance by billions of dollars. While under both considerations, costs were large in absolute terms, the EPA's analyses, discussed in detail in sections III.B and III.D above, found compliance costs are within the range of other expenditures by the power sector and were commensurate with revenues generated, and that these expenditures would not and did not have any significant impacts on electricity prices or reliability.

After considering and weighing all of the facts and circumstances associated with advantages and disadvantages of regulating EGU HAP, the Administrator determined, pursuant to his discretion under the CAA and prior case law, that regulation is appropriate and necessary under CAA section 112(n)(1)(A).

The EPA also disagrees with commenters that its consideration of costs is confined to whether the power sector can bear the cost of compliance. These commenters mischaracterize this action. In making the appropriate and necessary determination, the EPA is not simply determining it is appropriate to regulate EGU HAP because industry (or the country in general) can bear the cost of regulation, as some commenters suggest. Rather, the EPA is making a reasonable decision within its discretion that regulation is appropriate consistent with the Supreme Court's direction in *Michigan* v. *EPA* and informed by the studies required by CAA section 112(n)(1), which is founded upon consideration of whether the cost of regulatory compliance outweighs the benefits from the reduction in HAP. That inquiry includes consideration of the disadvantages conferred by expending those compliance costs and advantages conferred by reducing HAP. So, it is relevant to the EPA whether expending those compliance costs would affect the power sector's ability to provide reliable and affordable electricity. But that does not mean that the EPA has determined that regulation is appropriate so long as the regulated industry (or the country in general) can bear the expense regardless of the regulation's benefits. And the EPA has not made such a determination. Rather, in this action the EPA carefully weighed all of the advantages and disadvantages, consistent with *Michigan's* direction, and the Administrator determined that the benefits of MATS are worth its costs. *See Michigan* v. *EPA,* 576 U.S. at 755 (''[CAA section 112(n)(1)(A)'s] broad reference to appropriateness encompasses multiple relevant factors (which include but are not limited to cost)'').

As the EPA has noted elsewhere in its response to comments, under the EPA's preferred totality-of-the-circumstances approach the EPA found it is appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs under CAA section 112(n)(1)(A) regardless of non-HAP emission reduction benefits. However, the EPA determined that if it considers non-HAP emission reduction benefits, such as the benefits (including reduced mortality) of coincidental reductions in PM and ozone that flow from the application of controls on HAP, the balance weighs even more heavily in favor of regulating HAP emissions from coal- and oil-fired EGUs. Considering non-HAP emission reduction benefits is consistent with the statute, economic principles, and long-standing Federal agency practice. For further discussion in support of the EPA's consideration of non-HAP emission reduction benefits, see section 4.1 of the 2023 RTC Document.

The EPA further disagrees with commenters that CAA section 112(n)(1)(A) does not permit the EPA to give ''particular weight'' to sensitive populations. Congress directed the NIEHS to conduct a study to determine the threshold level of exposure under which no adverse effect to human health would be expected to occur, even considering exposures of sensitive populations, and throughout CAA section 112, Congress placed special emphasis on regulating HAP from sources to levels that would be protective of those individuals most exposed to HAP emissions and most sensitive to those exposures. Because the EPA was directed by Congress to consider the adverse effects of HAP emissions on the most sensitive populations, it is reasonable for the EPA to give particular weight to such considerations.

Finally, as explained in section III.E above, even assuming that a formal BCA is required to support the EPA's appropriate and necessary finding, the EPA has provided such an analysis to independently support its conclusion.

E. Comments on the Administrator's Benefit-Cost Analysis Approach and Conclusion

1. Use of Benefit-Cost Analyses in the Appropriate and Necessary Determination

Comment: Numerous commenters asserted that the use of the formal BCA framework was consistent with CAA section 112(n)(1)(A) statutory directive to the EPA, as interpreted by the court in *Michigan* v. *EPA,* and that the formal BCA approach was a reliable, analytic approach to tally benefits and costs of regulating EGUs under CAA section 112. Some commenters asserted that the formal BCA should be the primary driver for making an appropriate and necessary determination. They stated the formal BCA discharged the *Michigan* court's directive that costs were a ''centrally relevant factor'' in making an ''appropriate and necessary'' decision.

Response: The EPA agrees that a formal BCA, as represented by the original MATS 2011 RIA, is a meaningful alternative approach that further affirms the appropriate and necessary finding. However, given the challenges associated with quantifying and monetizing the full suite of adverse effects from EGU HAP emissions on human health and ecosystems, especially in a way that considers the impacts on the most susceptible populations, the formal BCA as provided in the original MATS 2011 RIA should not be the primary approach for determining whether it is appropriate and necessary to regulate coal- and oil-fired EGUs under CAA section 112(n)(1)(A). The EPA notes that the Supreme Court in *Michigan* specified the EPA was not required to conduct a BCA, but that it was up to the EPA's reasonable discretion how to account for costs. 576 U.S. at 759 (''We need not and do not hold that the law unambiguously required the Agency, when making this preliminary estimate, to conduct a formal cost-benefit analysis in which each advantage and disadvantage is assigned a monetary value. It will be up to the Agency to decide (as always, within the limits of reasonable interpretation) how to account for cost.''). Rather than relying primarily on a formal BCA, as described in the 2022 Proposal, the EPA prefers an approach which is rooted in the *Michigan* court's direction to ''pay[ ] attention to the advantages and disadvantages of [our] decisions.'' 576 U.S. at 753. Hence, the EPA considers all the advantages of reducing emissions of both HAP and any co-emitted criteria pollutants, regardless of whether those advantages can be quantified or fully monetized. The EPA weighs those advantages against all of the disadvantages of regulation. In following this totality-of-the-circumstances approach, the EPA found that the advantages of this final action (both quantified and unquantified) are substantial and far outweigh the disadvantages.

2. Considering $PM_{2.5}$ and Other Non-HAP Benefits in the Context of a CAA Section 112(n) Determination

Comment: Several commenters stated that, while the BCA approach offered a framework for weighing the advantages and disadvantages of regulation consistent with *Michigan* v. *EPA,* the EPA's formal BCA approach utilized in this action suffered from a flaw, as it focused on factors not relevant to what the EPA must find under CAA section 112(n). In the view of these commenters, since CAA section 112(n) was focused solely on HAP and was clearly intended to avoid, not rely on, duplicative regulations, the EPA's formal BCA should not include consideration of non-HAP EGU benefits such as those that accrue due to associated reductions in $PM_{2.5}$ or other non-HAP emissions. These commenters stated that the definition of ''benefits'' should exclude: (a) reductions that would occur anyway in absence of the rule due to non-regulatory drivers or due to other rules; (b) pollutant reductions below national health-based standards; (c) benefits that cannot be realized within the U.S. where the EPA's regulatory authority resides; and (d) benefits from co-emitted non-HAP emissions.

Response: The EPA disagrees with the commenters' interpretation of what factors are relevant when comparing the benefits and costs of a regulation. Consistent with economic theory and best practices, the EPA Guidelines for Preparing Economic Analyses direct the EPA to account for all positive consequences of a regulatory action, including those that are coincident to the policy objective; this is integral to proper economic analyses determining whether an action yields net benefits to society. The EPA's Guidelines describe the underlying rationale of a formal BCA, which is to evaluate the action according to the potential ''Pareto improvement criterion.'' The criterion, which is described in detail in the Guidelines, requires ''measuring net benefits by summing all of the welfare changes *for all affected groups*'' to answer the question of whether an action increases economic efficiency (p. 1–4, emphasis added). Consistent with scientific principles underlying BCA, both OMB Circular A–4 and the EPA's Guidelines for Preparing Economic Analyses direct the EPA to include all benefits in a BCA. Per Circular A–4, OMB instructs: ''Your analysis should look beyond the direct benefits and direct costs of your rulemaking and consider any important ancillary benefits and countervailing risks. An ancillary benefit is a favorable impact of the rule that is typically unrelated or secondary to the statutory purpose of the rulemaking.'' The reductions in criteria pollutants that are coincident with the MATS control technologies designed to reduce HAP emissions have known positive impacts on human health. Thus, quantifying and considering the benefits from non-HAP like $PM_{2.5}$ in the MATS BCA is entirely consistent with economic best practices. The EPA notes this approach is also entirely consistent with executive guidance on regulatory review, longstanding EPA practice, and the statute and legislative history of the MATS rule (see section II.B of the 2022 Proposal).

In response to the comment that benefits that would occur due to other rules or non-regulatory drivers should be excluded, we note that in the MATS BCA, the billions of dollars of benefits attributable to reductions in premature mortality from improving $PM_{2.5}$ air quality are exclusively attributable to the *ex-ante* projected emissions reductions for the MATS action and are not attributable to any other regulation. The EPA continues to assert that the EPA's practice to quantify health benefits of reducing $PM_{2.5}$ concentrations both above and below the levels of the NAAQS is reasonable and well-supported by scientific evidence. As noted by the EPA Administrator in the most recent PM NAAQS review,[82] the available evidence from epidemiologic, toxicologic and controlled human exposure studies does not reveal a ''population threshold, below which it can be concluded with confidence that $PM_{2.5}$-related effects do not occur. . .''.

V. Summary of Cost, Environmental, and Economic Impacts

The EPA estimates that there are currently 519 existing EGUs located at 250 facilities that are subject to the MATS rule. Because the EPA is not amending the MATS rule, there are no cost, environmental, or economic impacts as a result of this action. However, finalizing this affirmative threshold determination provides important certainty about the future of MATS for regulated industry, states, other stakeholders, and the public.

VI. Statutory and Executive Order Reviews

Additional information about these statutes and Executive orders can be found at *https://www.epa.gov/laws-regulations/laws-and-executive-orders.*

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

This action is a significant regulatory action that was submitted to the OMB for review. Any changes made in response to OMB recommendations have been documented in the docket. The EPA does not project any incremental costs or benefits associated with this action because it does not impose standards or other requirements on affected sources. However, finalizing this affirmative threshold determination provides important certainty about the future of MATS for regulated industry, states, other stakeholders, and the public.

B. Paperwork Reduction Act (PRA)

This action does not impose any new information collection burden under the PRA. OMB has previously approved the information collection activities contained in the existing regulations and has assigned OMB control number 2060–0567. This action does not impose an information collection burden because the EPA is not making any changes to the information collection requirements.

C. Regulatory Flexibility Act (RFA)

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. This action will not impose any requirements on small entities. The EPA does not project any incremental costs or benefits associated with this action because it does not impose standards or other requirements on affected sources.

D. Unfunded Mandates Reform Act (UMRA)

This action does not contain an unfunded mandate of $100 million or more as described in UMRA, 2 U.S.C. 1531–1538, and does not significantly or uniquely affect small governments. The action imposes no enforceable duty on any state, local, or tribal governments or the private sector.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the National Government and the states, or on the distribution of power and responsibilities among the various levels of government.

[82] U.S. EPA (2020), *Review of the National Ambient Air Quality Standards for Particulate Matter: Final Action.* EPA–HQ–OAR–2015–0072; FRL–10018–11–OAR. *https://www.govinfo.gov/content/pkg/FR-2020-12-18/pdf/2020-27125.pdf.*

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications as specified in Executive Order 13175. The Executive order defines tribal implications as ''actions that have substantial direct effects on one or more Indian tribes, on the relationship between the Federal Government and Indian tribes, or on the distribution of power and responsibilities between the Federal Government and Indian tribes.'' Revocation of the 2020 determination that it is not appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs under CAA section 112 and affirmation that it remains appropriate and necessary to regulate HAP emissions from EGUs after considering cost would not have a substantial direct effect on one or more tribes, change the relationship between the Federal Government and tribes, or affect the distribution of power and responsibilities between the Federal Government and Indian tribes because MATS remains in place. Thus, Executive Order 13175 does not apply to this action. While this action does not have tribal implications under Executive Order 13175, the EPA sent a letter to all federally recognized Indian tribes inviting consultation on this action. The EPA did not receive any requests from consultation from Indian tribes.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

This action is not subject to Executive Order 13045 because it is not economically significant as defined in Executive Order 12866, and because this action does not impose new regulatory requirements that might present a disproportionate risk to children. This action reaffirms that it is appropriate and necessary to regulate HAP emissions from U.S. EGUs, but does not impose control requirements, which were implemented through MATS (77 FR 9304; February 16, 2012). While this action does not impose or change any standards or other requirements, it addresses the underpinning for the HAP emission standards in MATS. The EPA believes the reductions in HAP emissions achieved under MATS have provided and will continue to provide significant benefits to children in the form of improved neurodevelopment and respiratory health and reduced risk of adverse outcomes. Analyses supporting the 2012 MATS Final Rule estimated substantial health improvements for children in 2016 in the form of 130,000 fewer asthma attacks, 3,100 fewer emergency room visits due to asthma, 6,300 fewer cases of acute bronchitis, and approximately 140,000 fewer cases of upper and lower respiratory illness. See 77 FR 9441 (February 16, 2012). Reaffirming the appropriate and necessary determination assures those benefits will continue to accrue among children.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This action is not anticipated to have impacts on emissions, costs, or energy supply decisions for the affected electric utility industry as it does not impose standards or other requirements on affected sources.

I. National Technology Transfer and Advancement Act (NTTAA)

This action does not involve technical standards.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629, February 16, 1994) directs Federal agencies, to the greatest extent practicable and permitted by law, to make EJ part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations (people of color and/or indigenous peoples) and low-income populations.

The EPA believes that the human health or environmental conditions that exist prior to this action result in or have the potential to result in disproportionate and adverse human health or environmental effects on people of color, low-income populations, and/or indigenous peoples. As documented in both the NAS Study and Mercury Study, fish and seafood consumption is the primary route of human exposure to methylmercury originating from U.S. EGUs, with populations engaged in subsistence-levels of consumption being of particular concern. As shown in section III.A.5 of the 2022 Proposal, certain people of color, low-income populations, and indigenous populations are more likely to experience elevated exposures, thus higher health risks relative to the general population due to subsistence fishing. Furthermore, subpopulations with the higher exposure tend to overlap with those subpopulations that are particularly vulnerable to small changes in health risk because of other social determinants of health (*e.g.,* lack of access to health care and access to strong schooling), thereby compounding the implications of the implications of mercury exposure.

The EPA believes that this action is not likely to change existing disproportionate and adverse effects on people of color, low-income populations, and/or indigenous peoples because it does not impose standards or other requirements on affected sources and is limited in scope to only consider whether it is appropriate and necessary to regulate HAP emissions from coal- and oil-fired EGUs. While this action does not impose or modify any standards or other requirements, it provides the underpinning for the emission standards regulating HAP from EGUs. The EPA additionally identified and addressed EJ concerns by reaffirming the appropriate and necessary determination, assuring that the reduction in risks achieved by MATS continue. Information supporting this Executive order review is provided in sections III.A.4 and IV.A.3 of this preamble as well as the 2021 Risk TSD. While this action is limited in scope and does not have tribal implications as discussed under Executive Order 13175, in addition to a public hearing, the EPA provided opportunities for meaningful involvement through actions such as offering consultation on the proposed action to Indian tribes, providing an overview of the proposed action and opportunity for tribal input on the February 2022 National Tribal Air Association Air Policy Update Call, and providing an overview of the proposed action and opportunity for input on the March 2022 EPA Monthly National Community Engagement Call.

K. Congressional Review Act (CRA)

This action is subject to the CRA, and the EPA will submit a rule report to each House of the Congress and to the Comptroller General of the United States. This action is not a ''major rule'' as defined by 5 U.S.C. 804(2).

Michael S. Regan,

Administrator.

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