SUMMARY: In this action, EPA is proposing to approve a revision to the Oregon State Implementation Plan and repeal rules which are no longer required by the Clean Air Act. The revision consists of the repeal of Oregon's control technology guidelines for perchloroethylene (perc) dry cleaning systems. Perc is a solvent commonly used in dry cleaning, maskant operations, and degreasing operations. In 1996, EPA excluded perc from the Federal definition of volatile organic compounds for the purpose of preparing state implementation plans to attain the national ambient air quality standards for ozone under title I of the Clean Air Act. Emissions from perc dry cleaners continue to be regulated as hazardous air pollutants under the National Emissions Standards for Hazardous Air Pollutants.

DATES: Comments must be received on or before January 3, 2005.

ADDRESSES: Submit your comments, identified by Docket ID No. R10–OAR–2004–OR–0001, by one of the following methods:

- Federal eRulemaking Portal: *http://www.regulations.gov.* Follow the on-line instructions for submitting comments.
- Agency Web site: *http://www.epa.gov/edocket.* EDOCKET, EPA's electronic public docket and comment system, is EPA's preferred method for receiving comments. Follow the on-line instructions for submitting comments.
- Mail: Colleen Huck, Office of Air, Waste and Toxics, AWT–107, EPA, Region 10, 1200 Sixth Ave., Seattle, Washington 98101.
- Hand Delivery: Colleen Huck, Office of Air, Waste and Toxics, AWT–107, 9th Floor, EPA, Region 10, 1200 Sixth Ave., Seattle, Washington 98101. Such deliveries are only accepted during normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Please see the direct final rule which is located in the Rules section of this **Federal Register** for detailed instructions on how to submit comments.

FOR FURTHER INFORMATION CONTACT: Colleen Huck at telephone number: (206) 553–1770, e-mail address: *Huck.Colleen@epa.gov;* or Donna Deneen at telephone number: (206) 553–6706, e-mail address: *Deneen.Donna@epa.gov,* fax number: (206) 553–0110, or the above EPA, Region 10 address.

SUPPLEMENTARY INFORMATION: For further information, please see the direct final action, of the same title, which is located in the Rules and Regulations section of this **Federal Register**. EPA is approving the State's SIP revision as a direct final rule without prior proposal because EPA views this as a noncontroversial SIP revision and anticipates no adverse comments. A detailed rationale for the approval is set forth in the preamble to the direct final rule. If EPA receives no adverse comments, EPA will not take further action on this proposed rule.

If EPA receives adverse comments, EPA will withdraw the direct final rule and it will not take effect. EPA will address all public comments in a subsequent final rule based on this proposed rule. EPA will not institute a second comment period on this action. Any parties interested in commenting on this action should do so at this time. Please note that if we receive adverse comment on an amendment, paragraph, or section of this rule and if that provision may be severed from the remainder of the rule, EPA may adopt as final those provisions of the rule that are not the subject of an adverse comment.

Dated: October 29, 2004.

Richard Albright,

Acting Regional Administrator, Region 10.

[FR Doc. 04–26475 Filed 11–30–04; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 60 and 63

[OAR–2002–0056; FRL–7844–8]

RIN 2060–AJ65

Proposed National Emission Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards of Performance for New and Existing Stationary Sources, Electric Utility Steam Generating Units: Notice of Data Availability

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of data availability (NODA).

SUMMARY: EPA issued a proposed Clean Air Mercury Rule (CAMR) under the Clean Air Act (CAA) concerning coal- and oil-fired electric utility steam generating units (power plants) on January 30, 2004,[1] and a supplemental proposal on March 16, 2004.[2] The proposed CAMR represents the first-ever Federal action to regulate mercury (Hg) from this source category. The proposed rule presents two primary alternative approaches to regulating Hg and nickel (Ni) from power plants. EPA received numerous comments on its proposed regulatory approaches, including comments on the modeling results EPA obtained using the Integrated Planning Model (IPM), which is a model that predicts how the power sector will respond to a particular regulatory approach, and comments addressing the speciation of Hg. EPA is currently evaluating those comments to determine how the new data and information received in the comments, as described below, may affect the benefit-cost analysis and regulatory options under consideration. Although we recognize that the public has access to the comments in the rulemaking docket, we are issuing the NODA, in part, because the Agency received over 680,000 public comments, including almost 5,000 unique comments, and the comments present new data and information that are relevant to the two primary regulatory approaches addressed in the proposed CAMR.

We are also issuing the NODA to seek input on our benefits methodology, which has been preliminarily revised since the CAMR was proposed. An analysis of benefits and costs is consistent with principles of good government and the provisions of Executive Order (EO) 12866. Based on comments received on the proposal and in furtherance of our obligations under EO 12866, we have preliminarily revised our approach to analyzing the benefits of reducing Hg emissions from power plants, and we are seeking comment on that revised approach, which is described in Section III below. Some of the commenters suggested approaches that differ from EPA's proposed revised benefits methodology. We identify those comments in Section III, as well as other comments that we received that provide analyses relevant to our refined benefits methodology.

DATES: Comments on the NODA must be received on or before January 3, 2005.

ADDRESSES: Comments on the NODA should be submitted to Docket ID No. OAR–2002–0056. Comments may be submitted by one of the following methods:

- Federal eRulemaking Portal: *http://www.regulations.gov.* Follow the on-line instructions for submitting comments.
- Agency Web site: *http://www.epa.gov/edocket.* EDOCKET, EPA's electronic public docket and comment system, is EPA's preferred method for receiving comments. Follow the on-line instructions for submitting comments.
- E-mail: *A-and-R-Docket@epa.gov.*

[1] 69 FR 4652, January 30, 2004.

[2] 69 FR 12398, March 16, 2004.

• Mail: Air Docket, Clean Air Mercury Rule, Environmental Protection Agency, Mail Code: 6102T, 1200 Pennsylvania Avenue, NW., Washington, DC 20460. Please include a total of two copies.

• Hand Delivery: EPA Docket Center, 1301 Constitution Avenue, NW., Room B108, Washington, DC. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments on the NODA to Docket ID No. OAR–2002–0056. The EPA's policy is that all comments received will be included in the public docket(s) without change and may be made available online at *http://www.epa.gov/edocket*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through EDOCKET, regulations.gov, or e-mail. The EPA EDOCKET and the Federal regulations.gov websites are ''anonymous access'' systems, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through EDOCKET or regulations.gov, your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses.

Docket: All documents in the docket are listed in the EDOCKET index at *http://www.epa.gov/edocket.* Although listed in the index, some information is not publicly available, *i.e.*, 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 form. Publicly available docket materials are available either electronically in EDOCKET or in hard copy at the EPA Docket Center, EPA West, Room B102, 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 Air Docket is (202) 566–1742.

FOR FURTHER INFORMATION CONTACT: William Maxwell, U.S. EPA, Office of Air Quality Planning and Standards, Emission Standards Division, Combustion Group (C439–01), Research Triangle Park, North Carolina 27711, telephone number (919) 541–5430, e-mail at *maxwell.bill@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline: The information presented in this NODA is organized as follows:

I. Additional Information on Submitting Comments
A. How can I help EPA ensure that my comments are reviewed quickly?
B. What should I consider as I prepare my comments for EPA?
1. Submitting CBI
2. Tips for Preparing Your Comments
II. Electric Utility Sector Modeling and Hg Speciation
A. What is the relevant background?
B. What are the specific issues relevant to electric utility sector modeling?
1. Overview
2. What is IPM?
3. What specific comments did EPA receive on its IPM modeling in response to the January 2004 proposal and the March 2004 supplemental proposal?
4. What are the areas of ongoing EPA research?
C. Issues of Hg Speciation
1. Overview
2. What specific comments on Hg speciation did EPA receive in response to the January 2004 proposal and the March 2004 supplemental proposal?
3. What are the areas of ongoing EPA research?
III. EPA's Proposed Revised Benefits Assessment
A. What is the relevant background?
B. How is EPA estimating reductions in Hg exposure associated with the CAMR?
C. Step 1 of EPA's Proposed Revised Benefits Methodology: Analyzing Hg Emissions from Other Sources
1. Overview
2. What specific comments did EPA receive on Hg emissions from other sources in response to the January 2004 proposal and the March 2004 supplemental proposal?
D. Step 2 of EPA's Proposed Revised Benefits Methodology: Analyzing Air Dispersion Modeling Capabilities
1. Overview
2. What specific comments did EPA receive on air dispersion modeling capabilities in response to the January 2004 proposal and the March 2004 supplemental proposal?
E. Step 3 of EPA's Proposed Revised Benefits Methodology: Modeling Ecosystem Dynamics
1. Overview
2. What specific comments did EPA receive on modeling ecosystem dynamics in response to the January 2004 proposal and the March 2004 supplemental proposal?
F. Step 4 of EPA's Proposed Revised Benefits Methodology: Fish Consumption and Human Exposure
1. Overview
2. What specific comments did EPA receive on fish consumption patterns in response to the January 2004 proposal and the March 2004 supplemental proposal?
G. Step 5 of EPA's Proposed Revised Benefits Methodology: How Will Reductions in Population-level Exposure Improve Public Health?

I. Additional Information on Submitting Comments

A. How Can I Help EPA Ensure That My Comments Are Reviewed Quickly?

To expedite review of your comments by Agency staff, you are encouraged to send a separate copy of your comments, in addition to the copy you submit to the official docket, to William Maxwell, U.S. EPA, Office of Air Quality Planning and Standards, Emission Standards Division, Mail Code C439–01, Research Triangle Park, North Carolina 27711, telephone (919) 541–5430, e-mail *maxwell.bill@epa.gov.*

B. What Should I Consider as I Prepare My Comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through EDOCKET, regulations.gov, or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information so marked will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

a. Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).

b. Follow directions—The Agency may ask you to respond to specific questions or organize comments by

referencing a Code of Federal Regulations (CFR) part or section number.

c. Explain why you agree or disagree; suggest alternatives and substitute language for your requested changes.

d. Describe any assumptions and provide any technical information and/or data that you used.

e. If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.

f. Provide specific examples to illustrate your concerns, and suggest alternatives.

g. Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

h. Make sure to submit your comments by the comment period deadline identified.

II. Electric Utility Sector Modeling and Hg Speciation

A. What Is the Relevant Background?

On January 30, 2004, EPA issued a proposed CAMR under the CAA concerning power plants.[3] That proposed rule presents two primary approaches to regulating Hg and Ni from power plants. Those approaches are (1) retaining the Agency's December 20, 2000, determination that regulating power plants under CAA section 112 is ''appropriate and necessary'' and issuing final emission standards under CAA section 112(d); and (2) revising our December 2000 ''appropriate and necessary'' determination, removing power plants from the CAA section 112(c) list, and issuing final standards of performance for coal-fired power plants using a ''cap-and-trade'' methodology.[4]

In response to the January 2004 proposal and the March 2004 supplemental proposal, we received over 680,000 public comments, including almost 5,000 unique comments. Among other things, the comments addressed how the power sector could respond to different levels of control on Hg emissions. In particular, we received comments on EPA's IPM modeling results, including our modeling assumptions. We also received modeling analyses conducted by different commenters, some of which used models and/or assumptions different from EPA's. Based on the importance of, and the level of interest in, these modeling analyses, this NODA summarizes the modeling analyses performed by commenters and solicits comment on the inputs and assumptions underlying those analyses and other issues related to benefit-cost analysis.

We also received comments concerning the speciation of Hg. As we explained in the proposed rule, the degree to which emissions control devices can remove Hg depends, in large part, on the amount of each form (or species) of Hg present in the flue gas. The three relevant species of Hg are elemental Hg (Hg^0), ionic or oxidized Hg (Hg^{+2}), and particulate Hg (Hg_p).[5] The Hg in the flue gas from a coal-fired utility unit consists of these three forms of Hg. Because of the importance of the relationship between Hg speciation and the level of Hg reduction achievable, we are seeking additional information on Hg speciation from coal-fired power plants to further inform our regulatory decision.

The comments concerning the impact of different levels of emissions control on the power sector and the speciation of Hg relate to both of the two proposed regulatory approaches described above. With respect to the CAA section 112(d) regulatory approach, the comments are relevant to whether EPA should adopt a CAA section 112(d) standard that is more stringent than the floor (*i.e.*, a beyond-the-floor standard) and at what level such a standard should be set. In evaluating a beyond-the-floor standard under CAA section 112(d), EPA must consider cost, nonair quality health and environmental impacts, and energy impacts.[6] With respect to the CAA section 111 regulatory approach, the comments are relevant to the level at which standards of performance should be set. Similar to the beyond-the-floor analysis under CAA section 112(d), EPA must consider cost, nonair quality health and environmental impacts, and energy requirements in defining the best system of emission reduction under CAA section 111.

We recognize that the public already has access to the comments submitted on the January 2004 proposed rule and the March 2004 supplemental proposal. However, because of the large volume of comments received on those proposals, we issue the NODA today to summarize and solicit comment on the new data and information presented in the comments that are relevant to benefit-cost analysis and to the regulatory approaches under consideration.

The Agency intends to make a final decision on its pending utility proposal by March 15, 2005. EPA is still considering the comments submitted on the proposal and supplemental proposal and evaluating which regulatory approach to pursue.

B. What Are the Specific Issues Relevant to Electric Utility Sector Modeling?

1. *Overview.* This section of the NODA addresses how the power sector is predicted to respond to different levels of emissions control. As we explained in the proposed CAMR, in designing regulatory programs for the electric power sector, it is important to consider (forecast) ways the power sector could respond to such programs.

In the proposed CAMR, EPA provided a forecast of how the power generation mix in the United States (U.S.) would respond to a particular regulatory approach.[7] In response to the proposed rule, several commenters provided their own forecasts of power sector response. In some cases, the regulatory scenarios modeled by commenters were the same or similar to those modeled by EPA. In these cases, we can better understand the importance of different input assumptions by comparing and contrasting the modeling performed. In other cases, the commenters modeled alternative approaches and provided information about the tradeoffs in regulatory design. The submitted modeling addresses regulatory alternatives that are both more and less stringent than our proposal. In all cases, the models are designed to predict a least-cost solution to meeting electricity demand, subject to the model input assumptions and constraints imposed. These constraints can include restrictions on the availability of specific control technologies. EPA is currently performing an evaluation of the modeling analyses submitted by commenters.

To aid in our decision-making process, we are seeking comment on the different input assumptions and constraints and the different modeled regulatory approaches as presented in the commenter's modeling analyses described below. We also identify below our questions of particular interest concerning the new data and information presented in the comments.

2. *What is IPM?* EPA uses IPM, developed by ICF Consulting (ICF), to assess how the electric power industry will respond to various environmental policies affecting that industry. IPM is a dynamic linear programming model that can be used to examine air pollution

[3] 69 FR 4652, January 30, 2004.

[4] The Agency also proposed standards of performance for oil-fired power plants that emit Ni. Although the Agency received several comments concerning its alternative proposals to regulate Ni from oil-fired power plants under CAA section 111 and CAA section 112, those comments are not the subject of this NODA. This NODA instead focuses only on issues related to Hg.

[5] 69 FR 4652, January 30, 2004.

[6] 42 U.S.C. 7412(d).

[7] 69 FR 4706, January 30, 2004.

control policies for Hg and other pollutants throughout the contiguous U.S. for the entire power system. IPM finds the least-cost solution to meeting electricity demand subject to environmental, transmission, reserve margin, and other system operating constraints for any specified region and time period. For a given control policy, IPM provides an electricity generator with various compliance options, including adding pollution controls, changing fuel type, and changing dispatch considerations. In addition, IPM provides information on fuel market interactions and impacts on the cost of electricity.

Through licensing agreements with ICF, IPM is used by both public and private sector clients. EPA contracted with ICF to develop a version of IPM that EPA uses for its own power sector modeling. EPA has used IPM to model the nitrogen oxides (NO_X) State implementation plan (SIP) call, the Clear Skies legislative proposal, the proposed Clean Air Interstate Rule (CAIR), and the proposed CAMR.[8] Documentation for how EPA has configured IPM for pollution control analys.nd

[8] 69 FR 4652, January 30, 2004.
[9] 69 FR 12401, March 16, 2004.

TABLE 1.—SUMMARY OF CCAP POWER SECTOR MODELING

	Hg phase 2 cap of 15 tons		Hg phase 2 cap of 10 tons		Hg phase 2 cap of 7.5 tons	
	2010	2020	2010	2020	2010	2020
Hg emissions	25 tons	18 tons	21 tons	13 tons	19 tons	11 tons.
Annual costs ($1999)	$3.3 billion	$6.7 billion	$4.3 billion	$6.8 billion	$4.6 billion	$7.1 billion.
Present value (2005–2025).	$64.5 billion		$71.3 billion		$75.0 billion	
Hg Marginal costs in 2020.	$62,190/lb		$75,190/lb		$88,060/lb	
Total installed capacity:						
FGD	179 GW	228 GW	171 GW	223 GW	174 GW	220 GW.
SCR	173 GW	229 GW	173 GW	214 GW	173 GW	213 GW.
ACI	13 GW	40 GW	34 GW	70 GW	46 GW	84 GW.

b. *What were the results of Cinergy's power sector modeling?* Cinergy used IPM to analyze the economic and environmental impact of potential CAIR and Hg policies. Cinergy used a version of IPM offered by ICF to its private sector clients. In addition, Cinergy provided their own modeling assumptions that differ from those used by EPA, including higher electricity demand growth, higher natural gas prices, different costs for subbituminous coal switching, higher costs for pollution control retrofits, and a higher discount rate.

The scenarios modeled by Cinergy included a CAIR only scenario, ''CAIR plus Hg trading'' scenario, ''CAIR plus EPA MACT'' scenario, and ''CAIR plus stringent MACT'' scenario. The ''CAIR plus stringent MACT'' scenario has no subcategorization and a 0.88 pounds per trillion British thermal units (lb/TBtu) rate for all affected units, starts in 2008, and assumes that ACI is not commercially available until 2010. Results of the Cinergy analysis of Hg reduction scenarios are summarized in Table 2 below. Present value costs are for a 20-year period and assume a 7 percent discount rate. Although Cinergy's modeling assumed the availability of ACI, Cinergy raised concerns about the availability and performance of ACI in the 2008 to 2010 timeframe.

For the CAIR only scenario, Cinergy's analysis projects a Hg co-benefit level in 2010 of 38 tons. For the ''CAIR plus Hg trading'' scenario, the Cinergy analysis projected Hg marginal costs from 2010 to 2020 to reach the safety valve price of $35,000/lb. Cinergy's model also projected lower bituminous coal consumption, 25 percent higher subbituminous coal consumption, and 10 percent higher lignite coal consumption when compared to EPA's Hg trading results. For the ''CAIR plus stringent MACT'' scenario, Cinergy modeling concluded that, due to the lack of ACI controls, units had to switch to lower Hg coals, install flue gas desulfurization/selective catalytic reduction (FGD/SCR), or shut down in order to achieve compliance. In addition, Cinergy concluded that an unrealistic number of FGD/SCR were installed by 2008 in order to meet the MACT limit (about 10 gigawatt (GW) of FGD and 30 GW of SCR). The Cinergy analysis projected that units burning subbituminous and lignite coals would shut down for 2 years because no technologies would exist until 2010 to comply with stringent MACT emissions limits. Cinergy's analyses predicted that natural gas- and oil-fired units would be operated to make up the generation short fall. This resulted in significant increases in power prices and fuel prices in the short term. Once ACI became available in the model in 2010, units installed such controls and started operating again.

TABLE 2.—SUMMARY OF CINERGY POWER SECTOR MODELING

	Hg trading plus CAIR		Proposed CAMR MACT plus CAIR		Stringent MACT plus CAIR	
	2010	2020	2010	2020	2010	2020
Hg emissions	32 tons	26 tons	33 tons	30 tons	9 tons	9 tons.
Present Value ($2000) for 20 year.	$65 billion		$64 billion		$130 billion	
Total installed capacity:						
FGD	150 GW	200 GW	160 GW	180 GW	180 GW	180 GW.
SCR	150 GW	160 GW	140 GW	170 GW	165 GW	175 GW.
ACI	10 GW	25 GW	15 GW	20 GW	120 GW	120 GW.

* **Note:** No annual costs were provided by Cinergy in their comments.

c. *What were the results of CATF's power sector modeling?* CATF modeled two MACT scenarios with the assistance of ICF using EPA's IPM 2003. The two scenarios modeled were: (1) EPA's CAMR MACT alternative proposal in combination with EPA's CAIR proposal (''CAMR MACT plus CAIR''), and (2) an ''Alternative Mercury Control Scenario.'' In their comments, CATF states that their ''Alternate Mercury Control Scenario'' is consistent with EPA's proposed ''CAMR MACT'' approach of basing subcategories on fuel rank; however, CATF notes that the emission rates used by EPA in its modeling do not represent what they believe to be MACT. The CATF states that their analysis is provided to ''demonstrate that more stringent Hg emission rates are feasible and highly cost-effective.''

The alternative emission rates CATF evaluated are standards representing 90 percent Hg reduction (measured as a reduction from the Hg content in the input coal) for bituminous-fired units,

1.5 lb/TBtu for subbituminous-fired units, and 4.5 lb/TBtu for lignite-fired units. As stated in the CATF comments, the 90 percent level was specified for bituminous-fired units because the version of IPM used by CATF could not simulate Hg reductions any higher than 90 percent through the use of retrofitted control technology. EPA notes, however, that IPM can model reductions greater than 90 percent through fuel switching, dispatch changes, or retirements.

A summary of the CATF analysis of the EPA proposed ''CAMR MACT plus CAIR'' and ''Alternative Mercury Control Scenario'' plus CAIR is provided in Table 3 below. EPA notes that the term ''total installed capacity'' used in Table 3 below includes all currently installed controls and control retrofits needed to meet modeled policy. EPA further notes that EPA's Base Case 2003 projects about 115 GW of scrubbers and 116 GW of SCR by 2010.

TABLE 3.—SUMMARY OF CATF POWER SECTOR MODELING

	CAMR MACT plus CAIR		Alternative Mercury Control Scenario plus CAIR	
	2010	2020	2010	2020
Hg emissions	26 tons	23 tons	12 tons	12 tons.
Annual costs ($1999)	$5.7 billion	$7.1 billion	$8.4 billion	$7.7 billion.
Total installed capacity:				
FGD	193 GW	233 GW	221 GW	224 GW.
SCR	145 GW	177 GW	172 GW	174 GW.
ACI	17 GW	19 GW	102 GW	102 GW.

* **Note:** No present value costs were provided by CATF in their comments.

CATF concluded that the ''Alternate Mercury Control Scenario'' results in shifts toward more bituminous coal use (in 2020, about 7 percent from Base Case 2003) and declines in subbituminous and lignite coal use (in 2020, about 27 percent and 13 percent from Base Case 2003, respectively). CATF projected a similar shift in reaction to EPA's proposed ''MACT plus CAIR'' scenario (*i.e.*, increase of about 5 percent for bituminous, decreases of about 24 percent and 15 percent for subbituminous and lignite, respectively). In addition, CATF concluded that the ''Alternate Mercury Control Scenario'' reduces coal use in 2020 by less than 1 percent compared to EPA's proposed ''CAMR MACT plus CAIR'' scenario, to a level that would be about 6 percent above current (2001) electric power generation coal consumption.

d. *What were the results of EEI's power sector modeling?* EEI's power sector modeling was performed using CRA's EPMM model. As noted above, EPRI's comments included the same CRA EPMM modeling analysis as EEI. Some of the EPMM modeling assumptions differ from those of EPA, including higher natural gas prices, higher electric growth demand, different Hg co-benefit assumptions for NO_X and SO_2 controls, and different costs and performance for ACI. The scenarios modeled by EEI include a CAIR-only scenario, ''CAIR plus EPA MACT'' scenario, and three ''CAIR plus Hg trading'' scenarios. EEI modeled two cases of the EPA-proposed Hg trading scenario with a 34-ton first-phase cap in 2010 and a 15-ton second phase cap in 2018. (Note that EPA did not propose a 34-ton first-phase cap but, rather, took comment on the appropriate level of the Phase 1 cap.) One of EEI's cases assumed a 2.5 percent annual improvement in variable operating costs for ACI, and the other did not include this assumption. EEI also modeled an alternative Hg trading scenario with a 24-ton cap in 2015 and a 15-ton cap in 2018, assuming 2.5 percent annual improvement in variable operating costs for ACI. Under this alternative option, early reduction credits can be earned and banked during the period 2010 to 2014 through early application of Hg control technologies (*e.g.*, ACI). To simulate early reduction credits, the EEI analysis set caps equal to co-benefits during this period. The co-benefits were defined as the Hg emissions from the comparable CAIR-only scenario, 39.9 tons in 2010 and 2011, and 38.5 tons for 2012 through 2014.

Results of the EEI analysis of Hg reduction scenarios are summarized in Table 4 below. Present value costs in Table 4 are for 2004 to 2020 and assume an 8 percent discount rate, consistent with EEI's analysis. For Hg trading scenarios, EPA notes that EEI projected emissions of 15 tons in 2020 appear to be an artifact of the grouping of the 2020 run year with the model end run year of 2040. EPA maintains that, in a least-cost solution model like EPMM, the model would solve for the cap in the final run year grouping. Therefore, Hg emissions reported for trading scenarios in the table below are those projected for 2019, because EPA believes they better represent emissions in 2020, *i.e.*, if 2020 had not been grouped with 2040. The Hg trading scenarios have been modeled without a safety valve.

EEI's analysis also included information on projected technology retrofits. EEI notes in their comments that these projections reflect the quantities necessary to comply with the proposed rules and may not reflect what is feasible to retrofit or what is commercially available. EEI also noted in their comments, that although they modeled the availability of ACI at 90 percent removal, the cost and effectiveness of ACI control technology remains uncertain, especially on subbituminous coal-fired units.

TABLE 4.—SUMMARY OF EEI POWER SECTOR MODELING*

	Proposed CAMR MACT plus CAIR		Hg trading plus CAIR		Hg trading plus CAIR (improved ACI costs)		Alternative Hg trading plus CAIR (improved ACI costs)	
	2010	2020	2010	2020	2010	2020	2010	2020
Hg emissions**	32 tons	30 tons	34 tons	24 tons	34 tons	24 tons	37 tons	23 tons.
Annual costs ($1999).	$4.4 billion	$6.8 billion	$2.5 billion	$8.1 billion	$2.5 billion	$8.0 billion	$2.6 billion	$7.7 billion.

TABLE 4.—SUMMARY OF EEI POWER SECTOR MODELING*—Continued

	Proposed CAMR MACT plus CAIR		Hg trading plus CAIR		Hg trading plus CAIR (improved ACI costs)		Alternative Hg trading plus CAIR (improved ACI costs)	
	2010	2020	2010	2020	2010	2020	2010	2020
Present value (2004–2020).	$27.8 billion		$19.7 billion		$19.1 billion		$19.4 billion	
Hg marginal costs in 2020.	Not applicable		$37,285/lb		$32,536/lb		$32,536/lb	
Total installed capacity:								
FGD	153 GW	180 GW	128 GW	192 GW	128 GW	193 GW	129 GW	195 GW.
SCR	134 GW	153 GW	120 GW	148 GW	121 GW	148 GW	121 GW	148 GW.
ACI	67 GW	67 GW	16 GW	107 GW	16 GW	112 GW	16 GW	112 GW.

*EPRI comments submitted the same modeling analysis.
**Emission results are presented for 2019.

4. *What are the areas of ongoing EPA research?* EPA is in the process of evaluating the above comments and data and, as noted above, has developed certain preliminary reactions to the comments. We are seeking comment on certain aspects of the above modeling analyses. As demonstrated by the above summaries of the comments, estimates of the impact of Hg regulation on the power sector are sensitive to model input assumptions. To increase the accuracy of EPA's power sector modeling as related to forecasting the power sector's response to environmental regulatory programs, we are seeking comment and/or additional information to inform our regulatory decision.

Moreover, since the January 2004 proposal and the March 2004 supplemental proposal, we have become aware of new information on the ability of sorbent injection technologies to remove Hg emissions from coal-fired power plants (*e.g.*, results of ACI testing over a period of several months at Southern Company's Plant Gaston, brominated activated carbon (B*PAC™) injection at Detroit Edison's St. Clair Power Plant, *etc.*). To this end, the Agency is seeking updated information on issues that may be relevant to assessing the assumptions employed in our power sector modeling (*e.g.*, removal efficiencies, capital and operating and maintenance (O&M) costs, timeline for commercialization, balance of plant issues, *etc.*). Specifically, we are interested in obtaining information on:

a. In some of EEI's analyses, EEI assumed a 2.5 percent annual improvement in variable operating costs for ACI. Is it appropriate for an economic forecast to assume an improvement in costs over time (such as through technology cost reductions or through future technology innovation), and, if yes, what level of improvement in costs should be assumed?

b. Due to model size considerations, limited knowledge on achievable levels of Hg control, and limited knowledge on assessing the full impact of the Hg speciation profile on control, IPM has limited Hg control retrofit options. Currently, IPM assumes that Hg reductions are achieved only through use of SCR and FGD or ACI (with or without fabric filter). (EPA notes that Hg reductions in IPM can also be achieved through fuel switching, dispatch changes, and retirements.) Should other control options be considered in EPA's power sector modeling (*e.g.*, retrofit of fabric filters and electrostatic precipitators, pre-combustion controls, and the optimization of SO_2 or NO_X controls)?

c. To the extent commenters believe that control considerations other than those noted in the proposal or in the preceding paragraphs should be included in power sector modeling, EPA is seeking data on the timeline for commercialization, cost, balance of plant issues, and performance of such control options.

d. CATF and Cinergy both modeled more stringent MACT-type options. However, CATF assumed that ACI would be available in 2005 for all coal types, while Cinergy assumed that ACI would be available in 2010 for all coal types for one MACT scenario modeled. (EPA notes that for Cinergy's other modeled scenarios, including a MACT scenario, it assumed ACI would be available in 2005.) The year of availability for ACI is an assumption that appears to have made a large difference in the projected impacts of a MACT-type option. (Note that in a January 2004 white paper, we projected that ACI technology would be available for commercial application after 2010 and that removal levels in the 70 percent to 90 percent range could be achievable. This assumes the funding and successful implementation of an aggressive, comprehensive research and development program at both EPA and the U.S. Department of Energy (DOE). Such applications represent only the initiation of a potential national retrofit program, which would take a number of years to fully implement. Since release of the white paper, we have received numerous comments on technology and have additional test data. We are currently evaluating this new information.) [10] What assumptions for ACI availability are most appropriate? Specifically, what date of availability for ACI technology is appropriate to consider in a modeling analysis, at what quantities, for what coal types, and why?

e. EEI estimated that ACI would be less expensive per pound of Hg removed than EPA has estimated. In addition, Cinergy assumed higher capital costs for ACI than EPA in its modeled scenarios. Are EPA's Hg control technology cost assumptions reasonable? Although EPA has information on the costs of ACI, EPA is seeking additional detailed data addressing the validity of the costs assumed for ACI.

f. Analyses by commenters and EPA of Hg trading programs indicate that variations in the first phase cap level and timing impact when the final cap level will be achieved (*i.e.*, the emissions reduction ''glide path''). Although banking in the first phase impacts the timing of achieving the second phase cap, it should not affect the cumulative Hg emissions reductions ultimately achieved under the program. EPA is seeking additional comment on the impact banking may have on the timing of achieving the second phase cap.

g. EPA received comments estimating the co-benefits of Hg reductions associated with implementation of the proposed CAIR (*i.e.*, the level of Hg

[10] *See* OAR–2002–0056–0043 and –0463.

reductions realized as a result of compliance with the proposed CAIR). Cinergy estimates a co-benefit level in 2010 of 38 tons as compared to current emissions of 48 tons. EEI estimates a co-benefit level in 2010 of 40 tons. Both groups modeled a 34-ton first phase cap. In light of these modeling analyses, EPA is seeking additional comment on the reasonableness of its current IPM assumptions co-benefit reductions. Emission modification factors (EMF) are one component of the estimated Hg co-benefits from the proposed CAIR. A comparison of co-benefit assumptions used in EPA and other modeling is provided in Table 5. We are also seeking comment on appropriate EMF.

TABLE 5.—HG REMOVAL ASSUMPTIONS FOR POLLUTION CONTROL EQUIPMENT

Name for control	EPA 2003 EMFs			CRA 2004 EMFs EIA			EIA AEO2004 EMFs		
	Bit EMF	Subbit EMF	Lignite EMF	Bit EMF	Subbit EMF	Lignite EMF	Bit EMF	Subbit EMF	Lignite EMF
PC/CS–ESP	0.64	0.97	1.00	0.65	0.80	0.90	0.64	0.97	1.00
PC/CS–ESP/FGD	0.34	0.84	0.56	0.40	0.65	0.65	0.34	0.73	0.58
PC/CS–ESP/FGD–Dry	0.64	0.65	1.00	0.50	0.85	0.90	0.64	0.65	1.00
PC/CS–ESP/SCR/FGD	0.10	0.34	0.56	0.15	0.65	0.65	0.10	0.73	0.58
PC/FF	0.11	0.27	1.00	0.25	0.35	0.90	0.11	0.27	1.00
PC/FF/FGD	0.10	0.27	1.00	0.15	0.25	0.60	0.05	0.27	0.64
PC/FF/FGD–Dry	0.05	0.75	1.00	0.15	0.75	0.90	0.05	0.75	1.00
PC/FF/SCR/FGD	0.10	0.15	0.56	0.10	0.25	0.60	0.10	0.27	0.64
PC/HS–ESP	0.90	0.94	1.00	0.80	1.00	1.00	0.90	0.94	1.00
PC/HS–ESP/FGD	0.58	0.80	1.00	0.45	0.70	0.70	0.58	0.80	1.00
PC/HS–ESP/FGD–Dry	0.60	0.85	1.00	na	na	na	0.60	0.85	1.00
PC/HS–ESP/SCR/FGD	0.10	0.75	1.00	0.15	0.70	0.70	0.42	0.76	0.64

Notes: PC: pulverized coal; CS–ESP: cold-side electrostatic precipitator; HS–ESP: hot-side electrostatic precipitator; FGD: flue gas desulfurization; SCR: selective catalytic reduction; FF: fabric filter; EMF: emission modification factor (% reduction = 1—EMF) EPA 2003 EMFs used by CATF and CCAP analyses; Charles River Associates (CRA) EMFs used in EEI analysis; AEO2004 EMF used in Energy Information Administration (EIA) modeling.

h. More recent test data than were available at proposal on subbituminous-fired units equipped with SCR indicate that SCR does not enhance the oxidation of Hg^0 on such coals and, thus, does not provide for additional capture in a wet scrubber.[11] Based on these test data, EPA is considering revising the EMF for subbituminous coal-fired units equipped with SCR and wet FGD in modeling for the final rule. For the EMF identified in Table 5 for such units, EPA recommends the use of the EMF control combination before a SCR is added (*i.e.*, ascribe no additional control due to the addition of the SCR). Thus, EPA is considering making the following three changes to the subbituminous coal EMF used in IPM: for CS–ESP/SCR/FGD, use CS–ESP/FGD (0.84); for FF/SCR/FGD, use FF/FGD (0.27); and for HS–ESP/SCR/FGD, use HS–ESP/FGD (0.80). EPA is seeking comment on these proposed EMF changes.

In addition, EPA notes that other recent test data (*e.g.*, DOE- and EPRI-sponsored testing on Hg controls) may be available that would influence EMF used in EPA modeling. EPA is seeking comment on the appropriateness of using other test data for EMF development and requests that commenters submit any test data that may be relevant.

[11] *See* OAR–2002–0056–1268 and –1270.

C. Issues of Hg Speciation

This section addresses the issue of Hg speciation. As explained further below, we are seeking additional input on the species (or form) of Hg emitted in the flue gas, the percentage of each species emitted in the flue gas, and how those percentages in total (*i.e.*, the speciation profile) affect the analysis of how the power sector could respond to different levels of emissions control.

1. *Overview.* To quantify the relative contribution of Hg emissions from U.S. coal-fired power plants on total nationwide Hg deposition, the EPA initiated an Information Collection Request (ICR) in 1999 under the provisions of CAA section 114. During this data collection effort, incoming coal shipments for all coal-fired power plants in the U.S. were tested for Hg content (for calendar year 1999) and other selected coal properties (*e.g.*, ash, sulfur and chlorine content, *etc.*). Additionally, during 1999, 81 power plants—chosen to be representative of the entire U.S. power plant sector—were tested for stack emissions of Hg using the Ontario-Hydro sampling method. The Ontario-Hydro method provided EPA with speciated Hg emissions (*i.e.*, Hg^0, Hg^{+2}, and Hg_p) for these tested units. Data from these tests were then extrapolated to all domestic coal-fired power plants and used to generate a national total Hg emissions estimate for 1999 (48 tons per year). These data were further used to provide a national estimate of emissions of the three forms of Hg as follows: Hg^0—54 percent, Hg^{+2}—43 percent, and Hg_p—3 percent. Plant-specific estimates based on these data were used in the IPM modeling activities discussed elsewhere in this notice. In general, eastern bituminous coals emitted the least amount of Hg^0 (the species most difficult to control); followed by western subbituminous coals (*e.g.*, Powder River Basin (PRB), *etc.*); and the northern and southern lignite coals. To this end, the 1999 ICR data collection effort provided EPA one of the most comprehensive databases available to date regarding Hg emissions from coal-fired power plants.

In the proposed CAMR, EPA discussed the relevance and importance of characterizing the species of Hg emitted in the flue gas and solicited comment on that issue. EPA received significant public input as a result. As we and commenters have recognized, the form (or species) of Hg emitted in the flue gas affects the ability to control Hg emissions [12] and the form of Hg released from a stack affects the atmospheric fate and transport of Hg. The species of Hg, therefore, is relevant to assessing the costs associated with different levels of Hg emissions control.

2. *What specific comments on Hg speciation did EPA receive in response to the January 2004 proposal and the March 2004 supplemental proposal?* A number of comments were provided on

[12] 69 FR 4672, January 30, 2004.

the importance of speciated Hg emission information and potential atmospheric transformations during the public comment period. Among these are comments or attachments submitted by the following: EPRI (OAR–2002–0056–2578); Hubbard Brook Research Foundation (HBRF) (OAR–2002–0056–2038); Southern Company (OAR–2002–0056–2948); Subbituminous Energy Coalition (SEC) (OAR–2002–0056–2379); and Utility Air Regulatory Group (UARG) (OAR–2002–0056–2922 and –2928).

EPRI provided information (in Section A of their report) on plume-simulating chamber studies that indicate transformation of Hg species in the plume. This work was followed by studies to evaluate the speciation changes in actual power plant plumes.

HBRF (in Section 3 of their report) provided comment on the validity of using an average speciation profile for all coal-fired power plants. SEC raised questions about the speciation profile for units burning a mix of coals. Southern Company and UARG indicated that, because the Hg speciation dictates the level of control that may be achieved with existing control equipment, different Hg emission limits must be established for the different coal ranks.

3. *What are the areas of ongoing EPA research?* EPA is evaluating all of the comments on speciation that it received in response to the proposed CAMR. To further aid in our review of these comments, to supplement our existing 1999 ICR database, and to aid in our decision-making process, EPA is seeking additional comment on the following areas.

a. We have received numerous comments on subcategorization by coal type and the speciation profiles resulting from the combustion of various coal types. We are seeking additional specific data and information on the speciation profiles of various types and blends of fuels.

b. Commenters have questioned the appropriateness of using a standard (or average) speciation profile in modeling analyses conducted for all coal-fired power plants. The Agency is seeking comment on if/when a standard (or average) speciation profile should be used for either the CAA section 111 or CAA section 112 regulatory approach.

c. Is it currently feasible, or will it be feasible within the compliance timeframes of the proposed rule, to accurately monitor a source's Hg emissions by species?

III. EPA's Proposed Revised Benefits Assessment

A. What Is the Relevant Background?

Consistent with EO 12866, EPA included a benefits assessment in the proposed CAMR. EPA received comments on that assessment. Based on those comments and in furtherance of our obligations under EO 12866, we have preliminarily revised our proposed approach to analyzing the benefits associated with Hg emission reductions from power plants. We explain below our proposed revised benefits methodology. We also identify below comments received on the proposed CAMR that provide analyses or information relevant to our proposed revised benefits approach. We further identify those commenters that presented approaches that differ from our revised approach, as described below. We seek comment on our proposed revised benefits methodology and on the strengths and weaknesses of the analytical approaches presented in the comments to the extent they relate to our proposed revised benefits methodology.

Although this section of the NODA addresses the benefits analysis that we must prepare for purposes of EO 12866, we recognize that the costs and benefits of reducing emissions are often inter-related. Thus, to the extent that we receive any comments or other information in the process of completing the benefits assessment for purposes of EO 12866 and to the extent that such information bears on the statutory factors relevant to setting either a beyond-the-floor standard for Hg under CAA section 112(d) or a standard of performance for Hg under CAA section 111, we intend to evaluate and consider that information as we make a final decision as to which regulatory approach to pursue.

B. How Is EPA Estimating Reductions in Hg Exposure Associated With the CAMR?

EPA's proposed revised benefits analysis attempts to estimate the extent to which adverse human health effects will be reduced as a result of reducing Hg emissions from coal-fired power plants. Translating estimates of reductions in Hg emissions from coal-fired power plants to health outcomes in humans is a function of a number of complex chemical, physical, and biological processes, as well as a wide variety of human behaviors and responses.

The relevant events and processes include the following:

- The magnitude and nature of current and forecasted Hg emissions from coal-fired power plants, as well as the magnitude and species of current Hg emissions from other sources, both domestic and international.
- The physical transport of vapor and particle-phase Hg emissions in the air, as well as the chemical transformations that occur to Hg as it reacts with other chemical species in the atmosphere.
- The deposition of inorganic Hg onto terrestrial and aquatic surfaces, and the transport of Hg from terrestrial systems to surface water bodies.
- The biological, chemical, and physical processes that control the rate of methylmercury (MeHg) production in surface waters and aquatic sediments and the bioavailability of Hg to organisms.
- The composition and complexity of aquatic food webs and species-specific factors such as diet composition, chemical assimilation efficiencies, and metabolism that affect the bioaccumulation of MeHg in fish.
- The extent to which specific water bodies are used for a variety of fishing activities, either by individuals or commercially.
- Different human fish consumption behaviors, including for specific subpopulations.
- The human response to MeHg exposure.

EPA's proposed revised benefits methodology attempts to characterize, either directly or indirectly, each of the above events and processes. EPA specifically is seeking to estimate the reduction in exposure to MeHg associated with reducing Hg emissions from coal-fired power plants. We are seeking comment on our proposed revised benefits approach, as described below. As noted above, we are also seeking comment on the comments that we received that are relevant to our proposed revised benefits methodology.

The following sections describe each of the steps of our proposed revised benefits methodology. Those steps can be categorized broadly as follows:

- Quantify Hg emissions that are projected from U.S. coal-fired power plants under the Base Case and CAMR and then quantify Hg emissions that result from sources other than U.S. coal-fired power plants. The power sector modeling described above and in more detail at *http://www.epa.gov/airmarkets/epa-ipm/* will assist in the quantification of Hg from U.S. coal-fired power plants.
- Model the atmospheric dispersion, atmospheric speciation, and deposition of Hg.

- Model the link between changes in Hg deposition and changes in the MeHg concentration in fish.
- Assess the types and amounts of fish consumed by U.S. consumers and, from that, assess the resulting MeHg exposure.
- Assess how reductions in human exposure to MeHg affects human health.

C. Step 1 of EPA's Proposed Revised Benefits Methodology: Analyzing Hg Emissions From Other Sources

1. *Overview*. As stated in the proposed CAMR, Hg exposure is both a domestic and a global issue. From a domestic perspective, power plants are one source of Hg air emissions, but there are other domestic sources of man-made Hg. Mercury also enters the atmosphere from a variety of natural processes, including, for example, volcanic eruptions, groundwater seepage, and evaporation from the oceans.

EPA currently does not have an inventory of natural or re-emitted sources suitable for modeling purposes. EPA does, however, have inventories concerning man-made domestic and international sources of Hg. These inventories have been used over the past decade in air quality and air deposition modeling.[13] [14] They are important because the first step of EPA's proposed revised benefits methodology is to quantify Hg emissions that result from sources other than U.S. coal-fired power plants. In particular, the inventories enable us to establish upwind and downwind boundary conditions to apportion exposure to non-natural domestic and international sources of Hg emissions.

The inventory sets that EPA currently is considering using include an update/modification to the 1999 National Emissions Inventory (NEI) for all U.S. anthropogenic sources for criteria pollutants and for all U.S. anthropogenic non-power plant sources for Hg emissions, the 1995 Canadian criteria pollutant inventory for Canadian anthropogenic sources, and the 2000 Hg inventory for Canadian anthropogenic sources.[15] EPA is also planning on using GEOS-CHEM for modeling boundary conditions representing the global background.[16]

EPA is also aware of research conducted by EPA and others (*e.g.*, at Cheeka Peak, WA; Steubenville, OH; Mauna Loa, HI; Mt. Bachelor, OR; and Okinawa).[17] That research, for example, provides important information about Hg fate and transport and relative domestic and international source contributions. The research also provides speciated high altitude atmospheric measurements of Hg. These measurements may improve our understanding of the atmospheric reactions that alter the chemical species of Hg in the atmosphere and that ultimately impact fate and transport of emissions originating in Asian countries and other international sources. This research is, therefore, directly relevant to the first step of our preliminary proposed revised benefits methodology, as it affects our ability to estimate the U.S. power plant contribution to total Hg deposition within the U.S. EPA is seeking comment on this step of its proposed revised benefits methodology.

2. *What specific comments did EPA receive on Hg emissions from other sources in response to the January 2004 proposal and the March 2004 supplemental proposal*? EPA received a number of public comments that are relevant to the issue of assessing Hg emissions from sources other than U.S. coal-fired power plants, including comments from the Center for Energy and Economic Development (CEED) (OAR–2002–0056–2256); EPRI (OAR–2002–0056–2578); HBRF (OAR–2002–0056–2038); National Mining Association (OAR–2002–0056–2434); TXU Energy (OAR–2002–0056–1831); and UARG (OAR–2002–0056–2922). Some of these comments employed different approaches for simulating boundary conditions for apportioning Hg exposure from domestic and international sources, and we are interested in obtaining public input on these alternative approaches and analyses.

D. Step 2 of EPA's Proposed Revised Benefits Methodology: Analyzing Air Dispersion Modeling Capabilities

1. *Overview*. The second step of our proposed revised benefits methodology requires modeling the atmospheric dispersion, atmospheric speciation, and deposition of Hg. This is a critical step in our analysis because to evaluate the benefits of reducing Hg emissions from coal-fired power plants, we need to understand how Hg moves through the atmosphere and how it is ultimately deposited.

Over the past decade, EPA has used a variety of analytical and numerical simulation tools to project the atmospheric transport, chemistry, and deposition of both criteria (*e.g.*, ozone, fine particles, etc.) and toxic (*e.g.*, Hg) air pollutants. These models range in complexity from simple, one-layer Gaussian dispersion models (*e.g.*, Industrial Source Complex (ISC3) model[18]) to more complex, multi-layer Lagrangian puff-type trajectory models (*e.g.*, Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model[19]), and finally to complex three-dimensional (3–D) Eulerian grid models (*e.g.*, Community Multiscale Air Quality (CMAQ) model[20] [21] [22]

EPA and others have been using a suite of complex numerical models to assess the transport and fate of Hg emissions in the local, regional, and global atmosphere. In the Utility Report to Congress, EPA relied heavily on the ISC3 dispersion model to assess near-field Hg deposition effects.[23] The HYSPLIT model has also been used extensively in the Great Lakes and Chesapeake Bay watersheds to analyze source-receptor relationships for Hg deposition in these areas.[24] The

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[13] Pacyna, J.M., E.G. Pacyna, F. Steenhuisen, S. Wilson. 2003. Mapping 1995 Global Anthropogenic Emissions of Mercury. Atmosph. Env., 37, p. 109–117.

[14] Seigneur, C., K. Vijayaraghavan, K. Loman, P. Karamchandani, C. Scott. 2004. Global Source Attribution for Mercury Deposition in the United States. Environ. Sci. Technol., 38, p. 555–569.

[15] The update of the 1999 NEI (1) updates emissions of criteria pollutants to 2001, (2) removes fugitive dust sources of Hg in the few States where the original 1999 NEI includes them, and (3) replaces the 1999 NEI estimates of 1999 Hg emissions from medical waste incinerators with more recent data on 2002 emissions. The original 1999 NEI is posted at *http://www.epa.gov/ttn/chief/net/1999inventory.html*. The 2001 criteria pollutant inventory for U.S. sources is available in EPA Docket ID No. OAR–2003–0053, and is the same as made available in the Notice of Data Availability for the Clean Air Interstate Rule (69 FR 47828, August 6, 2004). The updated/modified 1999 U.S. Hg inventory and the Canadian inventory for all pollutants are posted at *http://www.epa.gov/ttn/chief/emch/invent/index.html*.

[16] *See http://www-as.harvard.edu/chemistry/trop/geos/*.

[17] *See http://oaspub.epa.gov/eims/eimsapi.dispdetail?deid=56181*.

[18] *See http://www.epa.gov/scram001/tt22.htm#isc; http://www.epa.gov/scram001/userg/regmod/isc3v2.pdf; and http://www.epa.gov/scram001/7thconf/iscprime/useguide.pdf*.

[19] *See http://www.arl.noaa.gov/ready/hysplit4.html*.

[20] Amar, P., R. Bornstein, H. Feldman, H. Jeffries, D. Steyn, R. Yamartino, Y. Zhang. 2004. Review of CMAQ Model, December 17–18, 2003. *See http://hill.nccr.epa.gov/air/interstateairquality/pdfs/PeerReview_of_CMAQ.pdf*.

[21] Community Multiscale Air Quality (CMAQ) Model Documentation. *See http://hill.nccr.epa.gov/air/interstateairquality/pdfs/CMAQ_Documentation.pdf*.

[22] Byun, D.W., N. Moon, D. Jacob, R. Park. Linking CMAQ with GEOS–CHEM. *See http://hill.nccr.epa.gov/air/interstateairquality/pdfs/GEOSCHEMforCMAQ_Description.pdf*.

[23] U.S. EPA. February 1998. op. cit. pp. ES–16, ES–20, and 7–28.

[24] Cohen, M., R. Artz, R. Draxler, P. Miller, L. Poissant, D. Niemi, D. Ratte, M. Deslauriers, R. Duval, R. Laurin, J. Slotnick, J. Neetesheim, J. McDonald. 2004. Modeling the Atmospheric

Continued

Regional Modeling System for Aerosols and Deposition (REMSAD),[25] a 3–D Eulerian grid model, has been used in recent years for several State-based total maximum daily load (TMDL) assessments for Hg deposition to local watersheds.[26] In addition, REMSAD was used to assess the depositional changes associated with the implementation of the Clear Skies Act of 2003.[27]

More recently, EPA and EPRI have applied 3-D Eulerian modeling platforms to assess both domestic and global Hg deposition, respectively. EPA has been evaluating the atmospheric transport, transformation, and deposition of Hg using the CMAQ model over four 1-month periods (two in 1995 and two in 2001) and over the entire year of 2001.[28] CMAQ uses a ''one-atmosphere'' approach and addresses the complex physical and chemical interactions known to occur among multiple pollutants in the free atmosphere. The spatial resolution (*i.e.*, the ability to observe concentration or depositional gradients/differences) of the gridded output information from CMAQ is generally considered to be either 36 kilometers (km), 12 km, or 4 km; however, to date, CMAQ results have only been developed for Hg modeling at the 36 km resolution. In simulating the transport, transformation, and deposition of pollutants, CMAQ resolves 14 vertical layers in the atmosphere, and employs finer-scale resolution near the surface to simulate deposition to both terrestrial and aquatic ecosystems. CMAQ transport is defined using a higher-order meteorological model, commonly the Fifth-Generation Pennsylvania State University/National Center for Atmospheric Research mesoscale model (MMM5) [29] (current modeling analyses are planning to use calendar year 2001 meteorological data).

Currently, EPA is planning to use REMSAD and CMAQ for modeling the atmospheric dispersion, speciation, and deposition of Hg. EPA is specifically planning to use CMAQ version 4.4 with Hg with a horizontal resolution of 36 km and 14 vertical layers and REMSAD version 7.13 also with a horizontal resolution of 36 km and 14 vertical layers. As described above, EPA is planning to use the GEOS–CHEM global model for boundary conditions input to both REMSAD and CMAQ. EPA is seeking comment on its proposed use of REMSAD and CMAQ to evaluate how Hg moves through the atmosphere and how it will ultimately be deposited.

An important aspect of the second step of our proposed revised benefits methodology is the evaluation of the REMSAD and CMAQ modeling. In evaluating modeling, we seek to compare the simulated results with ambient monitoring information to assess the quality of the modeled simulations. The Mercury Deposition Network (MDN) provides the only source of routinely available empirical domestic Hg deposition information. MDN is a collaborative network involving several organizations (*e.g.*, United States Geological Survey (USGS), National Oceanic and Atmospheric Administration, EPA) and is part of the National Atmospheric Deposition Program (NADP) network of sites across the U.S.[30] As of spring 2003, the MDN contained approximately 90 sites across the U.S. and Canada, which provide measurements of wet deposition of total Hg, integrated over weekly intervals.

We recognize the need to complement the MDN wet deposition measurements with dry deposition measurements because it is not clear how significant dry Hg deposition is to total ecosystem deposition. Currently, there is no recognized field method for measuring dry deposition. State-of-the-art atmospheric models indicate that the rate of dry deposition of Hg can be of a similar order of magnitude as wet deposition. Although the current extent of the MDN is relatively limited—as compared to the extensive networks for ozone and fine particles—EPA believes that the MDN data are the best available to evaluate the predictive capabilities of regional- and national-scale models. The MDN was not developed to monitor deposition near large sources and is of limited use for evaluating near-field deposition from models. We are seeking comment on how to use the MDN or related information in evaluating the numerical modeling analyses discussed above.

2. *What specific comments did EPA receive on air dispersion modeling capabilities in response to the January 2004 proposal and the March 2004 supplemental proposal?* We received a number of public comments on the use of analytical and numerical models for assessing the impacts of the proposed regulatory programs on Hg deposition patterns. Among these are comments or attachments submitted by the following: CEED (OAR–2002–0056–2256); CATF, NRDC, *et al.* (OAR–2002–0056–3460); EPRI (OAR–2002–0056–2578); and UARG (OAR–2002–0056–2922). Some of these commenters suggested alternative approaches to assessing the atmospheric transport and deposition of Hg, and we seek comment on those approaches.

E. Step 3 of EPA's Proposed Revised Benefits Methodology: Modeling Ecosystem Dynamics

1. *Overview.* In the above steps of our proposed revised benefits methodology, we seek to quantify changes in Hg deposition associated with Hg reductions from U.S. coal-fired power plants. The third step involves modeling affected ecosystems. As we explained in the proposed CAMR, the main route of human exposure to MeHg is through consumption of fish containing elevated levels of MeHg. Accordingly, to estimate the changes in human exposure to MeHg that may result from reductions in Hg emissions from U.S. coal-fired power plants, we must first quantify how changes in Hg deposition from U.S. coal-fired power plants (forecasted using the models described above) translate into changes in MeHg concentrations in fish. Quantifying the linkage between different levels of Hg deposition and fish tissue MeHg concentration is the third step of our proposed revised benefits methodology.

To effectively estimate fish MeHg concentrations in a given ecosystem, it is important to understand that the behavior of Hg in aquatic ecosystems is a complex function of the chemistry, biology, and physical dynamics of different ecosystems. The majority (95 to 97 percent) of the Hg that enters lakes, rivers, and estuaries from direct atmospheric deposition is in the inorganic form.[31] Microbes convert a small fraction of the pool of inorganic Hg in the water and sediments of these ecosystems into the organic form of Hg (MeHg). MeHg both bioconcentrates and biomagnifies. In the environment this process is referred to as bioaccumulation. MeHg is the only form of Hg that biomagnifies in organisms.[32]

Transport and Deposition of Mercury to the Great Lakes. Environ. Res., 95, p. 247–265.

[25] *See http://remsad.saintl.com/.*

[26] ICF Consulting. August 5, 2004. EPA Region 6—REMSAD Air Deposition Modeling in Support of TMDL Development for Southern Louisiana. Final Report. Prepared for EPA Region 6.

[27] *See http://epa.gov/clearskies/air_quality_tech.html.*

[28] Bullock, O., K. Brehme. 2002. Atmospheric Mercury Simulation Using the CMAQ Model: Formulation Description and Analysis of Wet Deposition Results. Atmosph. Environ., 36, p. 2135–2146.

[29] *See http://www.mmm.ucar.edu/mm5/mm5-home.html.*

[30] *See http://nadp.sws.uiuc.edu/mdn/.*

[31] Lin, C-J., S.O. Pehkonen. 1999. The Chemistry of Atmospheric Mercury: A Review. Atmospheric Environment, 33, p. 2067–2079.

[32] Bloom, N.S. 1992. On the chemical form of mercury in edible fish and marine invertebrate tissue. Canadian Journal of Fisheries and Aquatic Sciences, 49, p. 1010–1017.

Ecosystem-specific factors that affect both the bioavailability of inorganic Hg to methylating microbes (*e.g.*, sulfide, dissolved organic carbon)[33][34] and the activity of the microbes themselves (*e.g.*, temperature, organic carbon, redox status)[35] determine the rate of MeHg production and subsequent accumulation in fish. The extent of MeHg bioaccumulation is also affected by the number of trophic levels in the food web (*e.g.*, piscivorus fish populations) because MeHg biomagnifies as large piscivorus fish eat smaller organisms. These and other factors can result in considerable variability in fish MeHg levels among ecosystems at the regional and local scale.

To analyze the link between Hg deposition and MeHg concentrations in fish in aquatic ecosystems across the U.S., EPA currently is considering using EPA's Office of Water's Mercury Maps (MMaps).[36] MMaps, which has been peer reviewed by EPA scientists and is currently undergoing external peer review, provides a quantitative spatial link between air deposition of Hg and MeHg in fish tissue. The external peer review materials will be placed in the docket as soon as they are available. The MMaps model suggests that changes in steady-state concentrations of MeHg in fish will be proportional to changes in Hg inputs from atmospheric deposition if air deposition is the only significant source of Hg to a water body; and if the physical, chemical, and biological characteristics of the ecosystem remain constant over time. This model is best applied to ecosystems where atmospheric deposition is the principal source of Hg to a water body and assumes that the physical, chemical, and biological characteristics of the ecosystem remain constant over time. EPA recognizes that concentrations of MeHg in fish are not expected to be at steady state. We also recognize that the requirement that all other conditions remain constant over time inherent in the MMaps methodology is not likely to be met. We further recognize that many water bodies, particularly in areas of historic gold and Hg mining in western States, contain significant nonair sources of Hg. Finally, we recognize that MMaps does not provide for a calculation of the time lag between a reduction in Hg deposition and a reduction in the MeHg concentrations in fish.

Despite these limitations of this model, EPA is unaware of any other tool for performing a national-scale assessment of the change in fish MeHg concentrations resulting from reductions in atmospheric deposition of Hg. As with all other aspects of our proposed revised benefits methodology, we seek comment on the use of the steady-state linear relationship between air deposition and MeHg concentrations in fish (*i.e.*, MMaps) and how the results of the application of this relationship should be interpreted to account for the inherent limitations described above.

To supplement the MMaps methodology, EPA is currently pursuing a number of case studies examining Hg deposition and bioaccumulation of MeHg in fish tissue. Dynamic ecosystem scale models are being used to estimate ecosystem response times following reductions in atmospheric Hg emissions, and to explore the uncertainty around the proportional relationship used by the MMaps model. In this project, EPA is considering modeling eight case studies spanning a range of ecosystem types and characteristics in the Eastern and Midwestern U.S. Dynamic watershed, water body, and aquatic bioaccumulation models will be linked and applied to selected ecosystems, and sensitivity analyses will be run to provide a context for estimating the range in the magnitude and timing of changes in fish MeHg concentrations in response to declines in Hg deposition that expected as the result of regulation of power plants. More information on the models EPA is considering using in the case studies (WASP, GBMM, SERAFM, EFDC, WhAEM2000, BASS, E–MCM) can be found on the Council for Regulatory Environmental Modeling (CREM) Models Knowledge Base (*www.epa.gov/crem*) and the Web site for the Ecosystem Research Division of the Office of Research and Development (ORD) (*http://www.epa.gov/athens/*).

In pursuing these case studies, EPA is seeking information on the strengths and weaknesses of different approaches for modeling the anticipated response of fish tissue MeHg concentrations to declines in deposition for a national-scale benefits methodology. The case studies will help determine the potential magnitude of response of the MeHg concentration in fish in marine and freshwater systems if atmospheric deposition from power plants are reduced, and what the expected time lag will be before a response is observed in fish. To complement these case studies, EPA is interested in both empirical information collected from ecosystems across the U.S. or modeled scenarios that show the temporal dynamics of Hg in different ecosystems.

The case studies will also help determine the effects of ecosystem properties other than total Hg loading on accumulation in organisms and suggestions for how such information should be incorporated into the exposure analysis. To complement these case studies, EPA is interested in both empirical information collected from ecosystems across the U.S. or modeled scenarios that show the effects of ecosystem properties other than total Hg loading on accumulation in organisms in different ecosystems and, specifically, on new knowledge related to factors affecting methylation and demethylation in a range of aquatic ecosystem types.

Using the best-available scientific understanding of key processes, these case studies will provide estimates of average rates and a distribution of Hg methylation rates and MeHg bioaccumulation factors (BAF) in different aquatic systems (freshwater and marine) across the U.S. for use in modeling. EPA seeks comment on data and/or analytical tools that can be used to forecast methylation rates and bioaccumulation rates in aquatic ecosystems.

These case studies should provide detailed information on time lag, important ecosystem properties other than deposition rates, Hg methylation rates, and Hg BAF that can be used to inform how the results of a national-scale MMaps application should be interpreted. We are seeking information on the strengths and weaknesses of applying MMaps to modeling the anticipated response of fish tissue MeHg concentrations to declines in Hg deposition for a national-scale benefits methodology. Additionally, EPA intends to document these case studies in the electronic docket for the CAMR and to make this information available to the public on the ORD's website as soon as possible.

There are two final issues on which we are seeking comment that are relevant to the third step in our proposed revised benefits methodology. First, MMaps is designed to simulate natural freshwater systems. We currently do not have an appropriate

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[33] Benoit, J., C.C. Gilmour, R.P. Mason, A. Heyes. 1999. Sulfide controls mercury speciation and bioavailability to methylating bacteria in sediment pore waters. Environ. Sci. Tech., 33(6), p. 951–957.

[34] Benoit, J.M., R.P. Mason, C.C. Gilmour, G.R. Aiken. 2001. Constants for mercury binding by dissolved organic matter isolates in the Florida Everglades. Goechim. Cosmochim. Acta, 65, p. 4445–4451.

[35] Hammerschmidt, C.R. and W.F. Fitzgerald. 2004. Geochemical controls on the production and distribution of mercury in near-shore marine sediments. Environ. Sci. Tech., 38(5), p. 1480–1486.

[36] Description of EPA's Mercury Maps model—*http://www.epa.gov/waterscience/maps/* and September 2001 Mercury Maps Peer Reviewed Final Report—*http://www.epa.gov/waterscience/maps/report.pdf.*

method for assessing how a change in the deposition of Hg relates to a change in the concentration of MeHg in fish tissue in fish found in marine environments and/or farm-raised species. We recognize, however, that marine and farm-raised species comprise a large proportion of the fish consumed by the U.S. population and, likely account for a significant fraction of the overall exposure. We are aware that EPRI has submitted an analysis that assumes the changes in Hg deposition resulting from regulation of emissions from coal-fired power plants will have an effect on MeHg concentrations in estuarine and marine species (salt-water species) proportional to the reduction in global emissions.[37] We are evaluating EPRI's proposed approach, but are also seeking comment on other potential approaches for analyzing effects in salt-water marine fish populations.

Second, as noted above, MMaps does not account for the time lag that exists between reducing Hg deposition and reducing MeHg concentrations in fish. MMaps instead assumes that a change in Hg deposition immediately translates into a change in MeHg fish tissue concentration. We are evaluating other tools that will enable us to assess this time lag issue. In particular, we are aware of the Mercury Experiment To Assess Atmospheric Loading In Canada and the U.S. (METAALICUS) study, which was cited in a number of comments received by EPA on the proposed CAMR. In METAALICUS, newly deposited Hg appeared to be more available to bactaale t(c ovtle t.)TjT* MeHs t(in Hs thataons in thcosystet fo,)TjT*ohanherctaodsre of(tim(.)Tj/F18 1 T10.703865 0 T

[37] *See* OAR–2002–0056–2578, –2589, and –2593.

[38] H. Hintelmann, R. Harris, A. Heyes, J.P. Hurley, C.A. Kelly, D.P. Krabbenhoft, S. Lindberg, J.W.M. Rudd, K.J. Scott, V.S. St. Louis. 2002. Reactivity and mobility of new and old mercury deposition in a boreal forest ecosystem during the first year of the METAALICUS study. Environ. Sci. Tech., 36, p. 5034–5040.

[39] U.S. EPA. August 2004. 2003 National Listing of Fish Advisories. Office of Water. EPA–823–F–04–016. Additional information available at *http://map1.epa.gov/*.

[40] U.S. EPA. November 2001. National Fish Tissue Study. EPA–823–F–01–028. *See http://www.epa.gov/waterscience/fishstudy/*.

[41] U.S. Food and Drug Administration. Mercury in Fish: FDA Monitoring Program (1990–2003). *See http://www.cfsan.fda.gov/frf/seamehg2.html.*

With the above information on MeHg concentrations in fish tissue in fresh- and salt-water fish, the next question is how do we compute exposures to affected populations? We recognize that our analysis must be based on MeHg estimates for fish that are typically consumed by the U.S. population. The NLFA contains samples that vary by size (*i.e.*, several are taken from fish that are potentially consumable based on size, while other samples are taken from smaller fish that are not likely to be consumed) and by species. To estimate the MeHg content in fish species that are typically consumed, EPA is evaluating the application of the NLFA and NFTS data to a statistical model developed by Dr. Stephen Wente, USGS, the National Descriptive Model of Mercury and Fish Tissue (NDMMFT).[42] The model uses statistical procedures to estimate a relationship between fish size and MeHg concentrations, while controlling for fish species, sampling method, location, and other factors. EPA intends to conduct a peer review of the application of this model to the NLFA and NFTS data and will place the appropriate materials in the docket when available.

We are also collecting information on fish consumption rates by different affected populations, particularly in the eastern half of the U.S. We recognize that many Americans consume seafood or freshwater fish; however, some subpopulations in the U.S. (*e.g.*, Native Americans, Southeast Asian Americans, and lower income subsistence fishers) may rely on fish as a primary source of nutrition and/or for cultural practices. Therefore, they may consume larger amounts and different parts of fish than the general population and may potentially be at a greater risk to the adverse health effects from MeHg due to increased consumption/exposure. We intend to use the following consumption data to complete our analysis concerning the relationship between reductions in MeHg concentrations in fish tissue and reductions of human exposure to MeHg.

a. *Women of childbearing age*—the National Health and Nutrition Examination Survey (NHANES) provides information based on the women who participated in the study.[43]

b. *Children*—Exposure Factors Handbook and NHANES provide information.

c. Subsistence fishers and ''high-end'' consumers (including, but not limited to Native Americans and Asian Americans)—The Exposure Factors Handbook provides information for subsistence Native American fishers; Journal articles (Peterson, *et al.*, 1994;[44] Hutchinson, *et al.*, 1994[45]) provide data for specific subpopulations such as specific Native American tribes and the Asian American population (*i.e.*, Hmong) located in the Eastern half of the U.S. Peterson, *et al.* (1994) assesses the fishing activity of the Chippewa in Minnesota and Wisconsin. Hutchinson, *et al.* (1994) assesses the fishing activities of the Hmong living in Minnesota, Wisconsin, and Michigan. Other studies exist for these populations, but they do not address consumption behavior in the Eastern half of the U.S. EPA is interested in additional information for subsistence anglers (freshwater and/or saltwater), and for Native Americans or Southeast Asian Americans living in the Eastern half of the U.S.

Finally, EPA notes that the Methyl mercury Water Quality Criterion, which establishes a MeHg fish concentration designed to be protective of human health, estimates fish consumption rates. EPA is seeking comment on whether the MeHg fish concentration set forth in the Water Quality Criterion or the fish consumption rates used in the Water Quality Criterion could be used for local, regional, or national assessments.[46]

2. *What specific comments did EPA receive on fish consumption patterns in response to the January 2004 proposal and the March 2004 supplemental proposal?* Several commenters identified existing fish consumption data, including: CATF, NRDC, *et al.* (OAR–2002–0056–3460); EEI (OAR–2002–0056–2929); EPRI (OAR–2002–0056–2578); Forest County Potawatomi Community (OAR–2002–0056–2173); Minnesota Conservation Federation, *et al.* (OAR–2002–0056–2415); and Southern Environmental Law Center (OAR–2002–0056–4222). We are seeking comment on the usefulness of the data provided by the commenters.

G. Step 5 of EPA's Proposed Revised Benefits Methodology: How Will Reductions in Population-Level Exposure Improve Public Health?

A variety of human health effects are associated with MeHg exposure. Published MeHg research suggests there may be neurological effects during fetal and child development, including intelligence quotient (IQ) decrements and more subtle effects on the ability to learn.[47] Numerous studies suggest that fish consumption has a beneficial cardiovascular effect in adult males as a result of its n-3 fatty acids (*e.g.*, Omega-3 fatty acids, *etc.*). However, research also raises the possibility that MeHg in fish can reduce the cardioprotective effects of fish consumption in adult males.[48] [49] [50]

The state-of-the-science regarding neurodevelopmental effects in children has been more thoroughly evaluated and reviewed than that for other health effects. A review by the National Academy of Sciences (NAS), published in July 2000, concluded that neurodevelopmental effects are the most sensitive and well-documented effects of MeHg exposure. EPA subsequently established a reference dose (RfD)[51] of 0.0001 milligrams per kilogram of body weight per day (mg/kg/day) derived from a neurodevelopmental endpoint based on the NAS review. NAS determined that EPA's RfD ''is a scientifically justified level for the protection of public health.''[52]

The RfD was based on three epidemiological studies of prenatal MeHg exposure in the Faroe Islands, New Zealand, and Seychelles Islands. These studies examined neurodevelopmental outcomes through the administration of numerous tests of

[42] *See http://water.usgs.gov/pubs/sir/2004/5199/.*

[43] Center for Disease Control. National Health and Nutrition Examination Survey. National Center for Health Statistics. *See http://www.cdc.gov/nchs/nhanes.htm* and *http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5343a5.htm*.

[44] Peterson, D.E., M.S. Kanarek, M.A. Kuykendall, J.M. Diedrich, H.A. Anderson, P.L. Remington, and T.B. Sheffy. 1994. ''Fish Consumption Patterns and Blood Mercury Levels in Wisconsin Chippewa Indians.'' *Environmental Health* 49(1):53–58.

[45] Hutchinson, R., and C.E. Kraft. 1994. ''Hmong Fishing Activity and Fish Consumption.'' *Journal of Great Lakes Research* 20(2):471–487.

[46] 66 FR 1345, January 8, 2001.

[47] National Academy of Sciences. July 2000. Toxicological Effects of Methylmercury. National Academy of Sciences/National Research Council; National Academy Press.

[48] Yoshizawa, *et al.* 2002. ''Mercury and the Risk of Coronary Heart Disease in Men.'' New England Journal of Medicine; Nov. 2002; 347(22): 1755–60.

[49] Guillar, *et al.* 2002. ''Mercury, Fish Oils, and the Risk of Myocardial Infarction.'' New England Journal of Medicine; Nov. 2002; 347(22): 1747–54.

[50] Salonen, *et al.* 1995. ''Intake of Mercury from Fish, Lipid Peroxidation, and the Risk of Myocardial Infarction and Coronary Cardiovascular, and Any Death in Eastern Finnish Men.'' American Heart Association, 1995.

[51] ''In general, the RfD is 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.'' *See http://www.epa.gov/iris/subst/0073.htm*.

[52] National Academy of Sciences. July 2000. op. cit.

cognitive functioning.[53] [54] [55] These tests provided partial or full assessments of IQ, problem solving, social and adaptive behavior, language functions, motor skills, attention, memory, and other functions. NAS found that all three studies are ''well-designed, prospective, longitudinal studies.'' [56]

EPA is considering using these three studies to conduct a benefits assessment. Specifically, EPA is considering focusing on IQ decrements associated with prenatal MeHg exposure as the i 61.opro3oimenerf quatencifimptioe A ie i 61.or as thn Neud Developme1.or

[53] Myers, *et al.* 2003. ''Prenatal Methylmercury Exposure from Ocean Fish Consumption in the Seychelles Child Development Study.'' The Lancet. Vol. 361; May, 2003.

[54] Crump, *et al.* 1998. ''Influence of Prenatal Mercury Exposure Upon Scholastic and Psychological Test Performance: Benchmark Analysis of a New Zealand Cohort.'' Risk Analysis, 18(6): 701–713.

[55] Grandjean. 1997. Cognitive Deficit in 7-Year-Old Children with Prenatal Exposure to Methylmercury. Neurotoxicology, 19(6): 417–428.

[56] National Academy of Sciences. July 2000. op. cit. at 267.

[57] *See http://www.epa.gov/ttn/ecas/regdata/Benefits/mercuryworkshop.pdf.*