Prepared Statement of
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at a Hearing on
The American Energy Initiative
– A Focus on What EPA's Utility MACT Rule Will Cost U.S. Consumers –
by the
Subcommittee on Energy and Power
Energy and Commerce Committee
United States House of Representatives
Washington, DC

February 8, 2012

Mr. Chairman and Members of the Committee:

Thank you for your invitation to participate in today's hearing. I am Anne E. Smith, and I am a Senior Vice President of NERA Economic Consulting. I am a specialist in environmental risk assessment and integrated assessment to support environmental policy decisions, which was a core element of my Ph.D. thesis at Stanford University in economics, with a minor concentration in decision sciences. I have performed work in the area of air quality cost and benefits analysis and risk assessment over the past thirty years, including as an economist in the USEPA's Office of Policy, Planning, and Evaluation, as a consultant to the USEPA Air Office, and in many consulting engagements since then for government and private sector clients globally. I have also served as a member of several committees of the National Academy of Sciences focusing on risk assessment and risk-based decision making. I have analyzed costs, risks and benefits of many U.S. air policies, including mercury, fine particulate matter ($PM_{2.5}$), ozone, regional haze, NO_2, SO_2, and greenhouse gases. I have been extensively involved in assessment of the evidence on risks from ambient $PM_{2.5}$ since EPA first turned to the task of identifying an appropriate National Ambient Air Quality

Standard (NAAQS) for $PM_{2.5}$ over fifteen years ago. I thank you for the opportunity to share my perspective today on the costs, economic impacts, and benefits of EPA's Utility MACT Rule. My written and oral testimonies reflect my own opinions, and do not represent any position of my company, NERA Economic Consulting.

The focus of this hearing is "What EPA's Utility MACT rule will cost U.S. consumers." (Because EPA calls this rule the "Mercury and Air Toxics Standards" (MATS) Rule, I will also refer to it as the "MATS Rule" in my testimony.) The MATS Rule's purpose is to control risks from hazardous air pollutants (HAPs) emitted by coal- and oil-fired electricity generating units (EGUs). I will address the cost issue directly, but wish to point out that if a source category is listed for HAP regulation, and the Administrator decides EPA must control the HAP using maximum achievable control technology (MACT), the Clean Air Act (CAA) requires EPA establish a MACT for existing sources that is determined without consideration of the cost. The threshold set of decisions to apply MACT to EGUs in the first place (*i.e.*, listing EGUs or whether any alternatives to the MACT standard are feasible) are what push EPA into a position of imposing a MACT, however costly the MACT may be. Those decisions are based on assessed risks from the HAPs. Much of my testimony is therefore focused on the lack of evidence of benefits from HAPs under the MATS Rule. I will explain how EPA is masking its lack of evidence of risks from EGU HAPs emissions with non-credible and inappropriately-attributed estimates of "co-benefits" from a non-HAP that EPA already is required to regulate to safe levels under separate provisions of the CAA. I will then describe some of the economic impacts of the MATS Rule that EPA has not reported.

I. Overview of the Cost and Benefits Estimated by EPA for the MATS Rule

By Executive Order of the President, a "Regulatory Impact Analysis" (RIA) is required for each major new rulemaking to provide the regulating agency's estimates of the benefits and costs of the rule. EPA's RIA for the MATS Rule (EPA, 2011b) reports costs and benefits only for a "snapshot" year, 2016, apparently selected because it is the first year when the MATS Rule may be fully implemented. The RIA reports that the annual costs in 2016 of the MATS Rule is $9.6 billion (stated in 2007 dollars, "2007$"), . These are incremental costs above and beyond a baseline of other emissions regulations that includes the Cross-State Air Pollution Rule (CSAPR). This is an extremely large cost for a single regulation, but the RIA contrasts this cost to an estimate of quantified benefits that ranges from $33 billion to $90 billion per year in that same snapshot year (also 2007$). Over 90% of those benefits are based on RIA estimates that between 4,200 and 11,000 premature deaths will be avoided per year (in 2016) as a result of the MATS Rule. Using these RIA estimates, EPA has made some misleading public statements, such as the following two bullets from its "Fact Sheet" for the MATS Rule:

> "The Mercury and Air Toxics Standards (MATS) will save thousands of lives and prevent more than 100,000 heart and asthma attacks each year while providing important health protections to the most vulnerable, such as children and older Americans" and,
>
> "The updated standards will create thousands of good jobs for American workers who will be hired to build, install, and operate the equipment to

reduce health threatening emissions of mercury, acid gases, and other toxic air pollutants. "[1]

Many in the public who read or hear only these misleading summaries of EPA's analyses may consider the MATS Rule's high cost of approximately $10 billion per year to be worth undertaking. When the onion layers are peeled back on both the benefits and costs estimates, however, a very different picture emerges. First, the reported benefits have nothing to do with HAPs at all. In fact, the total benefits EPA has quantified for reductions in the HAPs that are the purpose of the MATS Rule are only between $0.0005 billion and $0.006 billion (*i.e.*, between $500,000 and $6 million per year). In light of this fact, the Rule's large cost of $9.6 billion per year begins to appear quite disproportionate. That cost may appear larger still when one learns that it is likely to destroy hundreds of thousands more jobs than the several thousand jobs that EPA's Fact Sheet states will be created.

A closer read of the RIA reveals that *all* the "saved lives" and virtually all of the $33 billion to $90 billion of estimated benefits EPA has attributed to the MATS Rule are for purported coincidental reductions of a non-HAP – fine particulate matter ($PM_{2.5}$) – that is already regulated to safe levels separately under the CAA. Allowing such co-benefits to dominate RIAs detracts from RIAs' most valuable practical role, which is to help guide us toward regulations that provide cost-effective, minimally-complex management of societal resources. Moreover, the estimate of up to 11,000 lives saved is not a scientifically-credible estimate, for reasons I will explain later in my testimony.

1 EPA Fact Sheet: Mercury and Air Toxics Standard, "Benefits and Costs of Cleaning Up Toxic Air Pollution from Power Plants," (http://www.epa.gov/mats/pdfs/20111221MATSimpactsfs.pdf.)

II. No Cost-Benefit Case Exists for Any of the HAPs Groupings Regulated by the MATS Rule

A key feature of the MATS Rule is that it sets different MACT standards for three groupings of HAPs:

(1) for Hg,

(2) for the entire group of acid gases (using hydrogen chloride (HCl) as a surrogate),[2] and

(3) for the entire group of non-mercury metallic HAPs (using particulate matter emissions as a surrogate).[3]

EPA grouped the HAPs in this manner because the Agency found that the HAPs within each group can be most effectively controlled by a single type of technology that differs for each group. For example, control of non-Hg metal HAPs occurs primarily through particulate control devices, while control of acid gases is generally achieved using some form of flue gas desulfurization technology. Hg is more complex because several types of technology may be effective, but the most cost-effective on a stand-alone basis is activated carbon injection (ACI), which is uniquely targeted to capturing Hg.

Thus, EPA has performed a separate MACT analysis for each of these three groups of HAPs. Estimates of benefits and benefit-cost comparisons therefore must vary for each of the MACT provisions, and this information is needed to obtain insights about the merits of the three separate MACT provisions. Such insights can be useful because, under the CAA, regulation of listed HAPs does not necessarily have to be based on

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2 The acid gas of greatest concern as a risk driver in the MATS Rule is HCl (Strum *et al*., 2011, Table 5, p. 15).

3 The metallic HAPs of greatest concern as risk drivers in this MATS Rule are chromium VI (Cr^{+6}), arsenic (As), and nickel (Ni) (Strum *et al*., 2011, Table 5, p. 15).

MACT.[4] Although EPA has not provided such MACT-specific cost and benefit information, I have been able to develop an approximate disaggregation of the benefits and co-benefits using information in the RIA. I have also been able to approximately disaggregate EPA's estimate of the cost of the rule using the N_{ew}ERA Model.[5] The results are presented in Table 1 below.

Table 1. Approximate Attribution of Costs, Benefits, and Co-Benefits by Individual MACT Provision in the MATS Rule (2007$, rounded to nearest billion. Negative numbers are in red font.)

	(a) Benefits from HAPs reductions (billions/yr)	(b) Co-benefits from non-HAPs(*) (billions/yr)	(c) Costs (billions/yr)	(d) Net Benefits without co-benefits (billions/yr)	(e) Net Benefits including co-benefits (billions/yr)
Mercury MACT	< $0.1	$1 to $2	$3	-$3	-$2 to -$1
Acid Gases MACT	$0	$32 to $87	$5	-$5	$27 to $82
Non-Hg Metals MACT	$0	$1 to $2	$1	-$1	-$1 to $0
Total(**)	< $0.1	$33 to $90	$10	-$10	$23 to 80

(*) The range for co-benefits shown in this table spans from the lower end of the lower set of estimates (*i.e.*, based on a 3% discount rate) to the upper end of the higher set of estimates (*i.e.*, based on a 7% discount rate).
(**) Totals may not add up exactly due to rounding.

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4 In fact, the MATS Rule regulates organic HAPs (*e.g.*, formaldehyde) with a work practice standard rather than a MACT-based standard (MATS Final Rule, p. 353 of 1117, available at http://www.epa.gov/mats/pdfs/20111216MATSfinal.pdf).

5 NERA's N_{ew}ERA Model is designed to be able to assess, on an integrated basis, system costs to the power sector to meet any specified policy scenario, and the overall macroeconomic impacts of that policy scenario. N_{ew}ERA produces estimates of the power sector costs of the MATS Rule that are comparable to EPA's estimate of $9.6 billion per year for 2015. I also ran scenarios with the N_{ew}ERA Model for each of the individual MACT provisions on its own. Doing so identified the share of EPA's total cost that can be attributed to each of the three separate MACTs in the MATS Rule for Table 1 above. (There are synergies in the costs, such that the sum of the costs of the individual MACT provisions is about 10% higher than the cost when all three are imposed together. Since these synergies are shared in all of the two-way combinations of the MACTs, I reduced the model-estimated cost of each individual MACT by one-third of the savings from the three-way synergies to get the shares of the total cost due to each provision.) Technical information on the N_{ew}ERA Model is available at http://www.nera.com/67_7607.htm.

Column (a) of Table 1 shows that the only quantified HAP-reduction benefits of the MATS Rule are due to the Hg MACT, and that estimated benefit is so small that it is lost in the rounding errors of the rest of the numbers in the table. Thus, as Column (b) of Table 1 shows (and which one can confirm by looking at the RIA's Table ES-4[6]), effectively all of the $33 billion to $90 billion of benefits that EPA predicts would result from the MATS Rule are actually "co-benefits" from reductions of pollutants *that are not HAPs at all* but which EPA estimates also will be reduced in the course of efforts to control the HAPs to their MACT levels. Of this total, fully $32.6 billion to $89.6 billion is due to co-benefits from a single ambient pollutant – $PM_{2.5}$ – which is already the subject of health-protective regulation by EPA. (The remaining $0.4 billion of co-benefits is an estimate of the social benefit of reduced greenhouse gases, or "carbon," which comes from reduced coal-fired generation under the MATS Rule.)

Thus, as computed in Column (d) of Table 1, each of the three MACT provisions in the MATS Rule has *negative* net benefits (*i.e.*, their costs are greater than their benefits) if only the HAP-related benefits are counted. That net negative benefit is billions of dollars per year for each of the three MACT groups, and it is about negative $10 billion per year for the MATS Rule as a whole. However, it is also very interesting that even if co-benefits are included, as shown in Column (e), only the acid gases MACT group obtains a positive net benefit, while the MACTs for Hg and for the non-Hg metallic HAPs still have negative net benefits. As for the acid gases, if co-benefits *are* included, this group of HAPs is in the remarkable position of being viewed as passing a

6 EPA (2011b), pp. ES-6 to ES-7.

cost-benefit test by a vast margin, despite billions of dollars of cost and zero dollars of identified direct benefits from the acid gas reductions.

The huge co-benefits that are estimated for the acid gases MACT group occur because almost all of the $PM_{2.5}$ co-benefits that EPA has projected are due to reductions in the *sulfate* component of ambient $PM_{2.5}$. This, in turn, is almost entirely attributable to the requirement to reduce acid gases through installation of some form of flue gas desulfurization technology, which also reduces SO_2.[7] Incremental reductions of primary $PM_{2.5}$ emissions reductions due to the MATS Rule are only about 5% of the $PM_{2.5}$ reductions.[8]

Thus, inclusion in the MATS RIA of co-benefits from projected coincidental reductions in $PM_{2.5}$ – a non-HAP pollutant that is not the purpose or justification for a HAPs rule *and* which is regulated to safe levels under other provisions of the CAA (CAA) – is helping generate an inappropriate justification for costly controls of hazardous air pollutants from electric generating units. Furthermore, those $PM_{2.5}$ co-benefits only help build a cost-benefit case for the acid gases MACT category, which is notably the one MACT grouping for which EPA has not offered any evidence of direct health effects, as I will explain next.

There are many reasons why the $PM_{2.5}$ co-benefits should not be included in the MATS RIA, and why they are overstated and unreliable. I will explain those reasons in

7 The SO_2 reductions must be beyond what existing standards (such as CSAPR but also the $PM_{2.5}$ NAAQS and the SO_2 NAAQS) will require in order to be appropriate to consider as co-benefits. Otherwise they are merely being double-counted.

8 EPA (2011b), p. 5C-7. EPA also reports that nitrate $PM_{2.5}$ actually increases, but has not included this negative co-benefit in its co-benefits calculation.

Section IV of my testimony. First, however, given that the quantified benefits cited above are not due to HAPs, it is instructive to ask the question: *What risk reductions has EPA identified for the MATS Rule's reductions of the HAPs themselves?* .

III. Lack of Quantified Benefits from HAPs in the RIA Reflects Lack of Identifiable Current Health Risks from those HAPs.

Quantified estimates of benefits for reducing the HAPs that are the target of the MATS Rule (*i.e.*¸ the Rule's "direct benefits") are less than 0.02% of the total benefits that EPA has quantified for this rule. The RIA states that EPA believes there are substantial *unquantified* benefits, "including the overall value associated with HAP reductions" and points to the RIA's Tables ES-5 and ES-6 for a list of these unquantified HAP reduction benefits.[9] However, those tables list only PM health, PM welfare, ozone health, ozone welfare, NO_2 health, NO_x and SO_2 welfare, mercury health, and mercury wildlife effects.[10] Of these, only mercury is a HAP. The rest of the unquantified benefits listed are still co-benefits from non-HAP pollutants. Not one unquantified benefit is listed for acid gases, non-Hg metallic HAPs or organic HAPs. Perhaps the most telling fact of all is that discussion of risks from non-Hg HAPs consumes only 6.5 pages of the 510 pages of the RIA.[11] Below is a summary of EPA's estimates of benefits for mercury controls under the MATS Rule (which is discussed at length in the RIA), and a summary of what EPA has reported about the risks of acid gases and non-Hg metallic HAPs in technical support documents other than the RIA.

[9] EPA (2011b), p. ES-9.

[10] EPA (2011b), pp. ES-10 to ES-13.

[11] EPA (2011b), pp. 73-79.

a) Mercury

As noted above, EPA does quantify Hg-related risks and benefits from the Hg MACT provision, but despite exhaustive and comprehensive evaluation of the Hg risks to the most sensitive population (*i.e.*, children exposed *in utero* to high methylmercury concentrations), the final estimate of that benefit is miniscule: $500,000 to $6 million per year. This is so low because EPA estimates that the imposition of the MATS Rule would improve the IQ of those highly-exposed children by an average of only 0.00209 IQ points.[12] Such a change would not even be measurable in actual IQ testing (the average person's IQ score being 100). The RIA's Table ES-3, which summarizes the physical effects that lie beneath the monetized benefits estimates, does not report this tiny change per child, but instead provides a meaningless "sum of total lost IQ points" of 510.8 IQ points.[13] But even when aggregated in this way, the impact still appears small, given that the comparable sum of total IQ points among all children born each year is about 425 million.[14] It is small even compared to the total IQ points among the 244,000 children born each year that EPA estimates are exposed to methylmercury originating from freshwater fish caught from U.S. lakes and streams; they would have over 24 million IQ points in aggregate.

Although the RIA does not report it, one can infer the more extreme IQ change in a child born to a mother who eats recreationally-caught freshwater fish in quantities at the

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[12] EPA (2011b), Table 4-7, p. 56.

[13] EPA (2011b), Table ES-3, p. ES-5.

[14] This is calculated by multiplying the number of births in the US each year (about 4.25 million) by the average of 100 IQ points per person.

95th percentile level. It is 0.007 IQ points.[15] Thus, even the 95th percentile IQ loss estimate is smaller than anything that can be detected in IQ testing.

As small as the average IQ change per exposed child appears to be, EPA nevertheless assigns projected earnings losses to that change. The resulting estimate of the benefits that would result from the Hg reductions predicted under the MATS Rule is an aggregate present value improvement in that at-risk group's lifetime earning power of between $500,000 and $6 million.

Even these small Hg benefit estimates are clearly overstated, because EPA assumes that the entire reduction in fish tissue will occur instantaneously with the abatement of EGU emissions, and hence that the IQ benefits will occur in full by 2016. EPA's RIA acknowledges this is not a sound assumption, saying that its mercury benefits modeling:

> "does not account for a calculation of the time lag between a reduction in mercury deposition and a reduction in the MeHg concentrations in fish and, as noted earlier, depending on the nature of the watersheds and waterbodies involved, the temporal response time for fish tissue MeHg levels following a change in mercury deposition can range from years to decades depending on the attributes of the watershed and waterbody involved."[16]

The footnote EPA attaches to the above statement adds:

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[15] On p. 45 of the RIA (EPA, 2011b) EPA states that 25 gm/day is the fish consumption for the 95th percentile consumption level of recreational fishers, compared to its estimate of 8 gm/day for that population's average consumption level. The 95th percentile of IQ loss within the sensitive population is thus easily computed because increased fish consumption affects the estimated maternal Hg intake linearly (see RIA, equation 4.4, p. 44). Since 25 gm/day is about 3.13 times 8 gm/day, the 95th percentile child's IQ loss would be about 3.13 times .00209, or 0.007 IQ points.

[16] EPA (2011b), p. 4-18.

> "If a lag in the response of MeHg levels in fish were assumed, the monetized benefits could be significantly lower, depending on the length of the lag and the discount rate used." [17]

This means that any alternative, more realistic assumptions would have produced even lower monetized benefits for Hg.

b) Acid gases

Mercury benefits may be small even with their overstatement, but the RIA was unable to quantify any benefits at all for any of the acid gas, metallic, or organic HAPs reductions. EPA has not even identified any actual health risk associated with current levels of the acid gases.

None of the acid gases is listed as carcinogenic. "Hazard quotients" (HQs) are calculated to assess risk for HAPs that pose non-cancer health risks from chronic exposure. EPA states that if an HQ is 1.0, estimated exposures are at a level "that is likely to be without an appreciable risk of deleterious effects during a lifetime,"[18] but above that point, EPA considers the margin of safety against toxic effects to be too uncertain to be acceptable. EPA reported in its Preamble to the Proposed MATS Rule that the HQ for the key acid gas, HCl, never exceeded 0.05 in any of its inhalation risk estimates,[19] meaning that for EGUs, the predominant HAP in the acid gas MACT group

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17 EPA (2011b), p. 4-18.

18 Strum *et al.* (2011), p. 13.

19 76 *Fed. Reg.* 24976, footnote 170, at p. 25051. Although EPA notes that other acid gases (Cl_2, HF and HCN) were not included in the risk calculations "because of uncertainties in their emission rates," it is hardly likely that any of these other gases would involve a HQ so much closer to 1.0 than HCl, given that their total EGU emissions are less than 15% of total EGU HCl emissions (see Table 4 at p. 25005).

has a maximum risk that is 95% below a level that EPA deems protective of health with a safety factor included.

Neither has EPA presented any firm evidence that further controls of acid gases would benefit ecosystems:

> "In areas where the deposition of acids derived from emissions of sulfur and NO_x are causing aquatic and/or terrestrial acidification, with accompanying ecological impacts, the deposition of hydrochloric acid <u>could</u> exacerbate these impacts. Recent research <u>has suggested</u> that deposition of airborne HCl has had a greater impact on ecosystem acidification than previously thought, although direct quantification of these impacts remains an uncertain process."[20]

Thus, the reason EPA has not been able to quantify any direct benefits from controlling the acid gas HAPs is because it could not find any evidence of current acute or chronic health risks from EGU emissions of these gases. Section 112(d)(4) of the CAA gives EPA discretion to consider setting a "health-based" standard for a HAP that has an HQ below 1.0. A health-based standard can be less stringent (and less costly) than MACT, provided that it protects health with an ample margin of safety (for example, by ensuring HQs will be lower than 1.0). EPA has applied health-based standards for HCl under Section 112(d)(4) in other HAP rulemakings.[21]

c) Non-Hg Metallic HAPs

EPA performed an integrated analysis of cancer risks from non-Hg metallic HAPs at 16 power plants. EPA's updated analysis finds risks of about 1-in-a-million lifetime risk to an hypothetical, maximally-exposed individual at five of those power plants that

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[20] 76 *Fed. Reg.* 24976, at p. 25050, footnote omitted, emphasis added.

[21] 76 *Fed. Reg.* 24976, at, p. 25050.

had coal-fired units. At one of the five plants, the risk was 5-in-a-million.[22] The power sector submitted its own study during the Rule's comment period finding that none of the U.S. coal-fired plants have risk above 1-in-a-million. In the Final Rule, EPA dismisses that analysis, suggesting reasons its estimates may be biased low.[23] Regardless of which analysis is more correct (and the statutory implication for listing if a single plant is found to impose a maximal risk at the level of 1-in-a-million), it is apparent that even the highest of the assessed cancer risk levels that EPA has estimated from current EGU emissions of non-Hg metallic HAPs is very low, and would be lower still for the average person. Thus, it is no surprise that the RIA made no attempt to quantify benefits from these small risks. The result probably would have been even smaller than the benefits estimate EPA calculated for Hg.

IV. $PM_{2.5}$ Co-Benefits Estimates Should Not Be Included in RIAs for Non-PM Rulemakings Such as the MATS Rule

Thus, the RIA's benefit-cost justification for the MATS Rule is based solely on co-benefits from a non-HAP pollutant – $PM_{2.5}$ – that is already regulated under the CAA separately from HAPs. EPA's RIA for the MATS Rule is not unusual in this regard. I recently reviewed EPA's use of co-benefits in CAA-related RIAs that EPA has released since 1997 (the year that EPA first started to quantify public health risks from ambient $PM_{2.5}$). Among the full set of such RIAs, there were 27 finalized or still-proposed rules whose RIAs did quantify at least some benefits, and which were not directly targeting ambient $PM_{2.5}$. In 22 of those 27 (which are listed in Table 2 below), $PM_{2.5}$ *co*-benefits

[22] MATS Final Rule, p. 323 of 1117.

[23] MATS Final Rule, pp. 332-333 of 1117.

Table 2. Summary of Degree of Reliance on $PM_{2.5}$-Related Co-Benefits in RIAs Since 1997 for Major Non-$PM_{2.5}$ Rulemakings under the CAA
(RIAs with no quantified benefits at all are not in this table. Where ranges of benefit and/or cost estimates are provided, percentages are based on upper bound of both the benefits and cost estimates. Estimates using the 7% discount rates are used in all cases.)

Year	RIAs for Rules NOT Based on Legal Authority to Regulate Ambient $PM_{2.5}$	$PM_{2.5}$ Co-Benefits Are >50% of Total	$PM_{2.5}$ Co-Benefits Are Only Benefits Quantified
1997	Ozone NAAQS (.12 1hr=>.08 8hr)	×	
1997	Pulp&Paper NESHAP		
1998	NOx SIP Call & Section 126 Petitions		
1999	Regional Haze Rule	×	
1999	Final Section 126 Petition Rule	×	
2004	Stationary Reciprocating Internal Combustion Engine	×	
2004	Industrial Boilers & Process Heaters NESHAP	×	×
2005	Clean Air Mercury Rule	×	
2005	Clean Air Visibility Rule/BART Guidelines	×	
2006	Stationary Compression Ignition Internal Combustion		
2007	Control of HAP from mobile sources	×	×
2008	Ozone NAAQS (.08 8hr =>.075 8hr)	×	
2008	Lead (Pb) NAAQS	×	
2009	New Marine Compress'n-Ign Engines >30 L per	×	
2010	Reciprocating Internal Combustion Engines NESHAP	×	×
2010	EPA/NHTSA Joint Light-Duty GHG & CAFES		
2010	SO2 NAAQS (1-hr, 75 ppb)	×	> 99.9%
2010	Existing Stationary Compression Ignition Engines	×	×
2011	Industrial, Comm, and Institutional Boilers NESHAP	×	×
2011	Indus'l, Comm'l, and Institutional Boilers & Process	×	×
2011	Comm'l & Indus'l Solid Waste Incin. Units NSPS &	×	×
2011	Control of GHG from Medium & Heavy-Duty		
2011	Ozone Reconsideration NAAQS	×	
2011	Utility Boiler MACT NESHAP (Final Rule's RIA)	×	≥ 99%
2011	Mercury Cell Chlor Alkali Plant Mercury Emissions	×	
2011	Sewage Sludge Incineration Units NSPS & Emission	×	×
2011	Ferroalloys Production NESHAP Amendments	×	×

accounted for more than 50% of the quantified benefits. None of those rules would have had benefits greater than their costs but for the inclusion of those $PM_{2.5}$ co-benefits. The trend towards EPA's reliance on $PM_{2.5}$ co-benefits has become more pronounced with time. $PM_{2.5}$ co-benefits accounted for 99% to 100% of the total benefits in 8 of the 12 non-$PM_{2.5}$ RIAs released during 2010-2011. The RIA for the MATS Rule is thus just part of a co-benefits habit that EPA has come to rely on.

I released a report in December 2011 in which I evaluate EPA's practice of relying on co-benefits in non-PM RIAs from theoretical, practical, scientific, and analytical perspectives (Smith, 2011b). In that report I show how the theoretical formulation of benefit-cost analysis (BCA) – a key underpinning of RIAs – does not support inclusion of co-benefits from pollutants subject to their own, separate regulation. I also explain how allowing such co-benefits to dominate RIAs detracts from RIAs' most valuable practical role, which is to help guide us toward regulations that provide cost-effective, minimally-complex management of societal resources. In addition, my report explains how EPA's estimates of the risks of $PM_{2.5}$ have become less and less credible as EPA has come to rely more and more heavily on them to justify regulation of other pollutants.

The primary reason EPA's $PM_{2.5}$ co-benefits estimates have become less credible is that EPA is now extrapolating $PM_{2.5}$ risk estimates far below the lowest level of $PM_{2.5}$

for which risks have ever been estimated in the epidemiological literature.[24] Figure 1 below, which is copied from the MATS RIA,[25] helps illustrate the inflationary effect of extrapolation to levels below the lowest measured levels (LML) in the underlying statistical studies. The vertical axis of this figure shows the percentage of EPA's estimate of the MATS Rule's $PM_{2.5}$ mortality co-benefits (*i.e.*, the 11,000 lives saved) that is attributable to ambient $PM_{2.5}$ concentrations at or below each level on the horizontal axis. It shows that nearly all (*i.e.*, 100% on the vertical axis) of those 11,000 deaths are in populations that are in areas that are already in attainment with the current $PM_{2.5}$ annual NAAQS of 15 $\mu g/m^3$. Under current EPA policy, all of those estimated deaths would be deaths of people living in areas that are protected with an "adequate margin of safety" from $PM_{2.5}$ risks.

Figure 1 also shows that if EPA had not extrapolated below LMLs, about 89% of the estimated upper bound of MATS co-benefits would have been estimated as zero.[26] This is confirmed in the RIA, which reports that of the 11,000 estimated avoided

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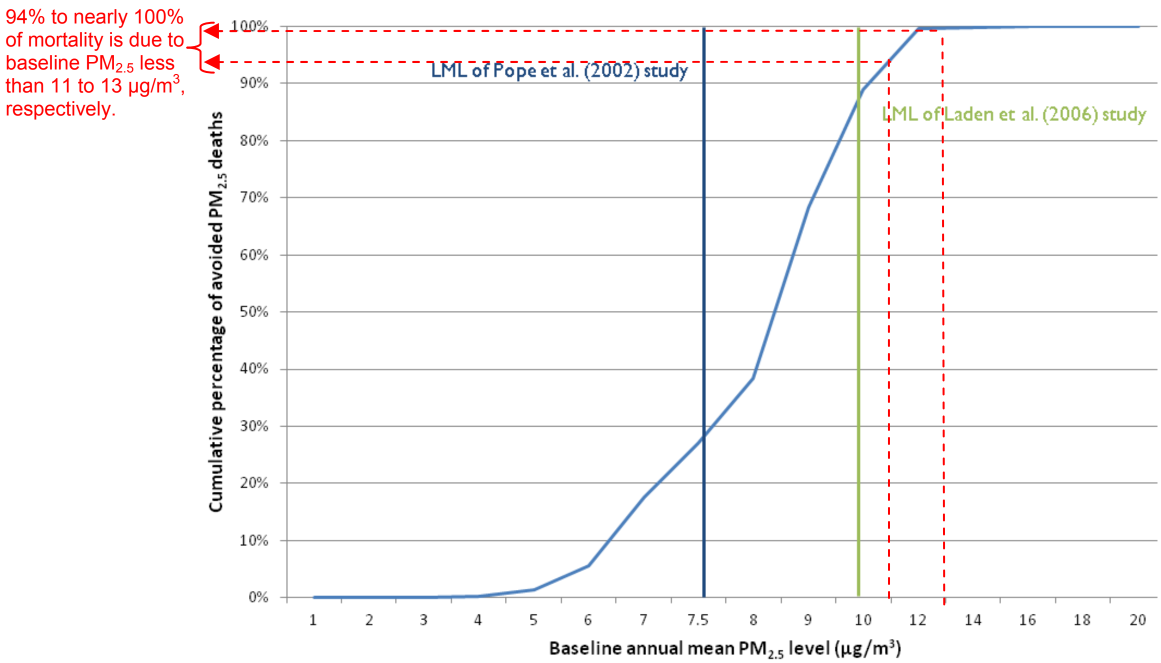
[24] Readers unfamiliar with the literature on $PM_{2.5}$ health risks should be aware that the estimates of $PM_{2.5}$-attributed deaths (such as the 4.200 to 11,000 that EPA is attributing to the MATS Rule) are based entirely on statistical associations between total mortality rates in various locations of the US and their respective monitored, region-wide ambient $PM_{2.5}$ concentrations. These mortality estimates are merely inferences drawn after making a host of assumptions about how to convert a statistical association into a concentration-response function, and all of the risk estimates that the RIA attributes to $PM_{2.5}$ are based on a *presumption* that the associations in the epidemiological literature are causal in nature – a presumption that remains under debate. A much more extensive explanation of the uncertainties and difficulties with this statistical body of evidence is provided in my recent report, as well as a more detailed explanation of what is meant by "extrapolation." (See Smith, 2011b, available at http://www.nera.com/67_7587.htm.)

[25] EPA (2011b), Figure 5-15, p. 5-102.

[26] The epidemiological study that generates the upper bound co-benefits estimate is the Laden et al (2006) study, whose LML is show at the green vertical line in the figure. That green line intercepts the blue curve at 89%, indicating that 89% of the total mortality is based on people in locations where the average ambient $PM_{2.5}$ concentration is less than the LML of 10 $\mu g/m^3$.

premature deaths, only 1,200 are in areas where to baseline $PM_{2.5}$ concentrations are above the LML.[27]

Figure 1. Copy of Figure 5-15 from EPA's RIA for the Final EGU MACT Rule Showing that 94% to Nearly 100% of the $PM_{2.5}$ Co-Benefits in that RIA Are Due to Changes in Exposures to Annual Average Ambient $PM_{2.5}$ that Will Still Be Deemed Safe by EPA after Revising the $PM_{2.5}$ NAAQS.



The 15 µg/m^3 annual $PM_{2.5}$ NAAQS is under review now, and EPA staff (with CASAC's concurrence) has stated that it will consider revising the annual $PM_{2.5}$ NAAQS to somewhere in the range of 11 to 13 µg/m^3.[28] EPA's reluctance to set the annual $PM_{2.5}$ NAAQS anywhere below 11 to 13 µg/m^3 would appear to reveal the extent to which EPA does not itself feel that risk estimates below that range are credible; if it did view them as credible estimates, surely EPA and CASAC would be compelled to propose a lower

27 EPA (2011b), Table 5-20, p. 5-101.

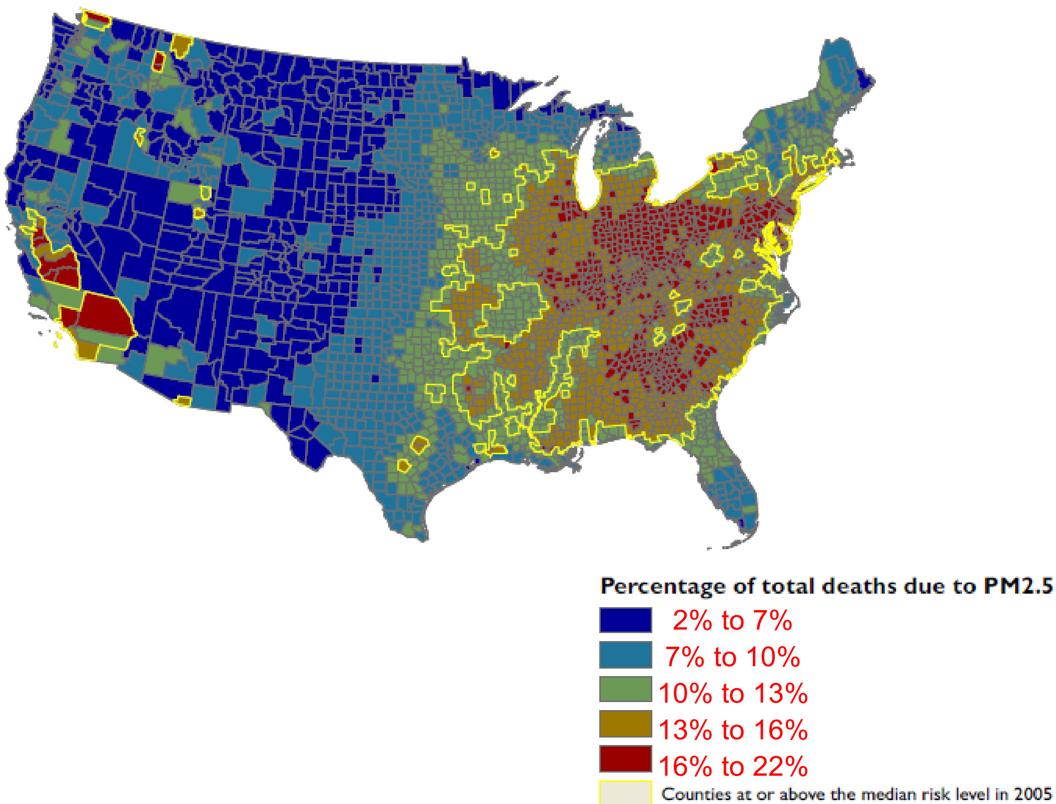
28 EPA (2010), p. 2-106.

$PM_{2.5}$ NAAQS. The figure above also shows how extrapolation below the LML has created large estimates of benefits at levels of average ambient $PM_{2.5}$ concentrations for which EPA and CASAC reveal a reluctance to declare that risks exist with strong probability. That is, dotted red lines have been added to Figure 1 to show that between 94% and nearly 100% of the 11,000 $PM_{2.5}$ mortality benefits that EPA has estimated from the Final EGU MACT are attributed to estimated $PM_{2.5}$ concentrations below levels that the Administrator will still deem protective of the public health with an adequate margin of safety even if EPA revises the annual $PM_{2.5}$ NAAQS to a level within its recommended range of 11 $\mu g/m^3$ to 13 $\mu g/m^3$.

If those concentrations are safe, then it is not appropriate for EPA to be calculating them as co-benefits justifying non-PM regulations such as the EGU MACT rule. However, my report (Smith, 2011b) also explains why those co-benefits estimates are non-credible from a scientific standpoint, which I recap here in the rest of this section.

Most scientists consider estimates that involve extensive extrapolation such as EPA is making to be very uncertain and generally lacking in credibility. However, the inflationary impact of this specific extrapolation reveals a true credibility deficit. Figure 2 below shows the percent of all mortality in the U.S. in 2005 on which the EPA's upper bound $PM_{2.5}$ co-benefits estimate for the MATS Rule is based. (Each colored zone on the map is a county.) This figure shows that, according to EPA, as recently as 2005 up to 22% of <u>all</u> deaths in many parts of the U.S. (*i.e.,* all of those counties colored dark red on the map) were "due to $PM_{2.5}$."

Figure 2. EPA-Produced Map Showing Percentage of Total Deaths due to $PM_{2.5}$ in the Year 2005, with Legend Adjusted by Author to Represent the $PM_{2.5}$ Risk Slope that EPA Uses for its Upper Bound $PM_{2.5}$ Risk Calculations. [29]



The absurdity of this estimate should be apparent from some basic statistics. EPA has never been able to identify the particular types of causes of death that account for its $PM_{2.5}$-mortality associations, but usually argues that cardiovascular deaths are the most likely candidate. In 2005, 35% of deaths in the U.S. were due to major cardiovascular

[29] Figure copied from EPA (2011a), Figure C-2. However, the figure in the RIA is presented for a $PM_{2.5}$ concentration-response slope that is not the one EPA uses to calculate its upper bound estimate of lives saved from the EGU MACT due to $PM_{2.5}$ co-benefits. That is, the text in EPA (2011a) explaining the derivation of the figure indicates that it is based on a $PM_{2.5}$ concentration-response slope from Krewski *et al*. (2009). EPA's current upper bound estimates of lives saved from $PM_{2.5}$ is based a concentration-response slope from Laden *et al.* (2006). Since the 2005 $PM_{2.5}$ levels in each county in the map would not change (they are historical data), the risk range for the scale can readily be recalculated for the Laden *et al*. slope, as done in this paper. An explanation of how this adjustment is made can be found in Smith (2011a).

diseases.[30] If the predicted $PM_{2.5}$-related deaths are indeed cardiovascular in nature, 22% of all deaths being "due to $PM_{2.5}$" would mean that nearly *two-thirds* of all cardiovascular deaths in 2005 were "due to" $PM_{2.5}$. Given all of the other risk factors that are known to be major contributors to cardiovascular mortality, such as smoking and weight, it is not credible to have a $PM_{2.5}$ co-benefit estimate that is implicitly assuming almost two-thirds of those types of deaths are due to $PM_{2.5}$. EPA's co-benefits estimates should be viewed as highly overstated just from these statistical implications.

Another inference can be made from EPA's post-2009 method of extrapolating $PM_{2.5}$-related mortality risks below the LML. It implies that about 25% of all deaths *nationwide* were due to $PM_{2.5}$ as recently as 1980.[31] These assumptions, which underpin EPA's co-benefits calculations, stretch the bounds of credibility, and thus undercut the credibility of all of EPA's $PM_{2.5}$-related mortality benefits estimates.

EPA's post-2009 baseline risks are so large because EPA now assumes that there is no tapering off of relative risk as $PM_{2.5}$ exposure approaches zero. For years there has been a debate about whether the concentration-response relationship can truly be linear down to zero, but this debate has been focused on questions of statistical power and on basic principles of toxicology. The linear-to-zero/no-threshold assumption has never been debated in terms of its implication that an implausible proportion of total deaths in the US would be due to $PM_{2.5}$ – but perhaps now it should be debated that way too.

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30 According to national death statistics, 856,030 U.S. deaths were due to "major cardiovascular diseases" out of 2,448,017 total U.S. deaths, which is 35%. (See http://www.disastercenter.com/cdc/Number%20of%20Deaths%20113%20Causes%202005.html.)

31 See Smith (2011a), pp. 14-16 for how this calculation is done.

The facts summarized above, and explained in more detail in my recent report (Smith, 2011b) make it clear that the vast majority of the co-benefits in EPA's MATS Rule are not credible. And without those co-benefits estimates, there is simply no benefits basis for the MATS Rule.

V. Given that the MATS Rule Has No Credible Identifiable Benefits, Costs of the MAT Rule Do Become a Relevant Topic

Once one strips away the non-credible and inappropriate façade of coincidental co-benefits from reducing an already-regulated non-HAP pollutant, the MATS Rule is left with almost nothing to justify its costs. There are no identifiable risks from reducing the non-Hg HAPs emissions under the acid gases and non-Hg metallic HAP MACT provisions. EPA has identified some potential benefits from reducing Hg, but when quantified as the benefits from the Hg MACT provision, those benefits are miniscule. In this situation, it does indeed become a valid question whether the costs of the MATS Rule, which even EPA estimates will be on the order of $10 billion per year, are warranted.

EPA's Fact Sheet for the MATS Rule refers only to positive aspects of that huge incremental spending rate: it mentions "thousands of good jobs" that will be created by the extensive spending on power sector retrofits.[32] It is important that the public also be informed about the economic downsides of that spending, but that is not provided by EPA. The facts not reported by EPA are that compliance with the MATS Rule will

[32] EPA Fact Sheet: Mercury and Air Toxics Standard, "Benefits and Costs of Cleaning Up Toxic Air Pollution from Power Plants," (http://www.epa.gov/mats/pdfs/20111221MATSimpactsfs.pdf.)

impose significant capital demands on the power sector, and net losses of job income and consumption on U.S. consumers.

Although EPA does not provide insight about the overall magnitude and impact of the MATS Rule, I can fill in some of those blanks based on close examination of the IPM inputs and outputs, supplemented by my own analyses using NERA's model, the N_{ew}ERA Model.[33] When I have run NERA's N_{ew}ERA model for the same baseline and MATS scenario, and the same assumptions about retrofit options and costs,[34] I have projected 2015 incremental annualized costs of $10.4 billion (2010$).[35] Working from this scenario, I have inferred other aspects of the EPA's electric sector costs. Also, because the electricity sector in the N_{ew}ERA Model is embedded in a macroeconomic model of the full U.S. economy, I can provide insights about the overall macroeconomic impacts that are associated with the estimated costs of the MATS Rule.

I find that to finance the costs to fully comply with the MATS Rule that are, when stated in annualized form, in the range of $10 billion per year by 2015, the U.S. electricity sector will have to raise about $84 billion (2010$) of additional capital between 2012 and 2015. This is a 30% increase over the capital spending projected within the U.S. electricity sector through 2015 under baseline spending (*i.e.,* including

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33 The N_{ew}ERA Model simulates the optimized operations and investments of the U.S. electric sector over a long-term horizon in a manner very similar to the IPM model on which EPA's cost analysis has been based. N_{ew}ERA, however, also embeds that electricity sector in a full equilibrium model of the entire U.S. economy, so that the macroeconomic impacts of changes in electric sector costs are simultaneously estimated. More information on the N_{ew}ERA Model is available at http://www.nera.com/67_7607.htm.

34 The only difference in assumptions about retrofit options in the N_{ew}ERA runs was to limit Dry Sorbent Injection (DSI) to units burning subbituminous coals and that have capacity less than 300 MW.

35 I consider this to be a reasonable approximation of EPA's own equivalent cost estimate, which is $9.8 billion when also stated in 2010$.

CAIR). This is a large increment for businesses in a single sector to absorb, and might create financing challenges that would drive up the cost of capital to these companies – a potential cost escalation that is not incorporated into either EPA's or my analyses.

Another important insight is that the added spending to comply with the MATS Rule will drive income for workers in a net downwards direction. Although the spending by the electricity sector will create jobs in some segments of the economy during the investment phase (*e.g.*, in construction), that same spending will also drive up costs of electricity and natural gas, and produce a net drag on the economy. For example, my analysis indicates that the net impact to U.S. workers in 2015 will be a reduction in worker income that is equivalent to about 200,000 full-time jobs. The net impacts are largest in the period around 2015, but remain a net negative through 2035.

These estimates of total worker income impacts are net of (*i.e.*, include) the increases in demand for labor to implement the electric sector's compliance projects. The vast majority of the reduction occurs in the services and non-energy manufacturing sectors, which have to absorb the higher natural gas and electricity prices induced by the MATS Rule.

Net negative impacts to the macroeconomy and to U.S. consumers appear in other common economic metrics as well. For example, present value (2012 through 2035) of GDP (relative to a baseline with CAIR only) is lower by about $100 billion and the present value (2012 through 2035) of consumption by U.S. consumers is reduced by about $70 billion.

VI. Conclusion

EPA's sole benefit-cost case for the MATS Rule is founded on non-credible, overstated estimates of coincidental reductions of a non-HAP that is already regulated. Even if those estimates could be viewed as credible, they have no place in the RIA for a rule that has the sole purpose of controlling HAPs. The use of $PM_{2.5}$ co-benefits to justify non-$PM_{2.5}$ rulemakings undercuts the practical purpose and value of RIAs. RIAs are intended to provide transparency about the impacts and merits of regulations, even when a benefit-cost justification is not the legal basis for setting the standard. One important purpose of RIAs (as stated in President Barack Obama's Executive Order 13563) is to help identify ways to reduce regulatory requirements that are "redundant, inconsistent, or overlapping."[36] The inclusion of $PM_{2.5}$ co-benefits in non-$PM_{2.5}$ regulations is lending an apparent benefit-cost justification to rules for which EPA actually has no such justification. Thus, the use of such co-benefits in non-$PM_{2.5}$ RIAs is only serving to enable costly redundancy in regulations, while also relieving EPA from the more pressing and scientifically challenging task of making the requisite cost-effectiveness demonstration for new regulations on pollutants such as HAPs. The MATS Rule is a perfect example of this problem.

[36] Executive Order 13563. "Improving Regulation and Regulatory Review." 76 *Fed. Reg.* 3821, January 18, 2011, Section 3. Available at: http://www.regulations.gov/exchange/sites/default/files/doc_files/President%27s%20Executive%20Order%2013563_0.pdf.

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