**Prepared Statement of**
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**at a Hearing on**
**"Quality Science for Quality Air"**
**by the**
**Subcommittee on Energy and the Environment**
**Committee on Science, Space, and Technology**
**United States House of Representatives**
**Washington, DC**

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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 and 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 been deeply involved in assessment of the evidence on risks from ambient fine particulate matter ($PM_{2.5}$) 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 have also analyzed costs, risks and benefits of many other key U.S. air policies, including ozone, regional haze, mercury and other air toxics, $NO_2$, $SO_2$, and greenhouse gases. I thank you for the opportunity to share my perspective today on the economic underpinnings of EPA's policy analyses for setting air quality standards. My written and oral testimonies reflect my own opinions, and do not represent any position of my company, NERA Economic Consulting.

The Chairman has asked me to describe my work analyzing major Clean Air Act regulations including National Ambient Air Quality Standards (NAAQS) and National Emission Standards for Hazardous Air Pollutants (NESHAPs), and to discuss any trends I have identified in EPA's analyses of such regulations. Although I have worked on these issues for over thirty years, I would like to focus my testimony today on analyses and research that I have done during 2011. In the past several months, I have reviewed and commented on the costs and benefits in EPA's Regulatory Impact Analysis (RIA) for the reconsideration of the ozone NAAQS. I have also prepared technical comments on the RIA for the proposed NESHAP for electric generating units, which was proposed in May 2011. That rule is commonly called the "Utility MACT" rule because it would impose maximum achievable control technology (MACT) standards on several categories of air

toxics emitted by electricity generators. I am presently in the process of reviewing the entire body of RIAs that EPA has produced for air quality regulations, to trace the history of some troubling patterns that I found in EPA's ozone and utility MACT RIAs.

My key findings, which I will explain in more detail below, are:

- EPA is relying to an extreme degree on coincidental "co-benefits" from $PM_{2.5}$ reductions to create the impression of benefit-cost justification for many air regulations that are not intended to address $PM_{2.5}$.
- In 2009, EPA vastly increased the levels of mortality risks that it attributes to $PM_{2.5}$ simply by starting to assign risks to levels of $PM_{2.5}$ down to zero exposure, thus "creating" risks from ambient exposures that are well within the safe range established by the $PM_{2.5}$ NAAQS.
    - This single change nearly quadrupled the pool of purported US deaths due to $PM_{2.5}$ that RIAs can now count as "saved" by minor incremental reductions in already-low ambient $PM_{2.5}$ levels projected under new rules.
    - This additional pool of $PM_{2.5}$-related mortality consists of the most non-credible sort of risk estimate, as it is derived from an assumption that a unit of exposure at $PM_{2.5}$ levels well below any observed in the epidemiological studies poses just as much risk as a unit of exposure at the higher $PM_{2.5}$ levels where associations have been detected.
    - With this change, EPA is now assuming that 13% to 22% of all deaths in the Eastern U.S. were due to $PM_{2.5}$ in 2005, and that *25% of all deaths nationwide* were due to $PM_{2.5}$ as recently as 1980.
- The decision to inflate the $PM_{2.5}$ risk estimates by presuming risks continue down to zero has its greatest impact on co-benefits estimates because – for rules that do not address $PM_{2.5}$ directly – a much greater share of their incremental reduction of $PM_{2.5}$ will occur in areas that are already in attainment with the $PM_{2.5}$ NAAQS (and thus that have $PM_{2.5}$ levels that EPA has deemed safe). Yet, EPA now attributes about 200,000 more $PM_{2.5}$-related deaths per year to exposures in those areas.
- If it were viewed as credible that such large effects exist below the level of the $PM_{2.5}$ NAAQS, the appropriate policy remedy would be to tighten the $PM_{2.5}$ standard, and not to regulate something else altogether in order to obtain those benefits through "coincidence."
- Co-benefits from a pollutant that EPA already can and does regulate should not be allowed to serve as the predominant benefit in RIA's for rules that target a different public health concern.

    $\Rightarrow$ Otherwise, RIAs will only help drive our nation towards regulatory complexity by creating the false appearance of a benefit-cost justification for regulations that are very costly compared to their own benefits.

**EPA is relying to an extreme degree on coincidental "co-benefits" from $PM_{2.5}$ reductions to justify air regulations that are not intended to address $PM_{2.5}$.**

As EPA releases each of its proposed and final air quality rules, it typically emphasizes that the rule will generate health benefits that exceed its costs. However, close inspection of the associated RIAs reveals that a majority of those benefits – sometimes *all* of them – are not from reductions in the pollutant(s) being targeted by the new regulation, especially in the case of air regulations that are targeting clean air objectives other than $PM_{2.5}$. For many of those, the bulk of the benefits estimates in their RIAs are attributable to reductions in already-low concentrations of ambient $PM_{2.5}$ that EPA has predicted will occur *coincidentally* as a result of regulation of those non-PM pollutant(s).

For example:

- In the Ozone Reconsideration RIA, up to 91% of EPA's benefits estimate for its preferred standard was due to EPA's predictions of coincidental $PM_{2.5}$ reductions rather than to reductions in ozone risks that were the target of the rule.[1] Not a single one of EPA's benefits estimates in that RIA exceeded its costs unless $PM_{2.5}$-mortality co-benefits were added in. By EPA's own calculations, all of the alternative ozone standards had ozone benefits that fell short of their costs by billions of dollars per year.[2]
- EPA has widely claimed that the Utility MACT rule, which targets air toxics, will save up to 17,000 lives per year, 11,000 heart attacks, and numerous other respiratory and cardiovascular ailments. But *all* of those purported health benefits are due to EPA's predictions of coincidental reductions of $PM_{2.5}$ – which is not an air toxic. Of all the air toxics targeted by this rule, EPA has estimated benefits for only one – mercury – and EPA's highest estimate of those mercury benefits is only $6 million per year, compared to EPA's estimate of $10.9 billion in costs per year. In the Utility MACT's RIA, over 99.99% of the benefits that EPA has attributed to the rule are due to $PM_{2.5}$ co-benefits rather than to the air toxics that are its purpose.[3]

In my on-going review of all air regulation RIAs, I have identified 28 RIAs released since 1996 that were for rules not targeting $PM_{2.5}$-related health risks. These are listed in Table 1 in chronological order.

[1] The preferred standard that EPA had forwarded to OMB for the Ozone Reconsideration was 70 ppb.

[2] A copy of my full review of the ozone RIA is available at http://www.nera.com/67_7390.htm. Parts of it are excerpted in the Appendix of this testimony.

[3] A copy of my full review of the Utility MACT RIA is available at http://www.nera.com/67_7412.htm. Parts of it are excerpted in the Appendix of this testimony.

**Table 1. Summary of Use of Co-Benefits in 28 RIAs for Air Rules Not Targeting Ambient $PM_{2.5}$**

| Year | RIAs for Rules Not Targeting Ambient PM2.5 | $PM_{2.5}$ Co-Benefits Are Majority of Total Benefits | Co-Benefits Are Only Benefits Quantified |
|---|---|---|---|
| 1996 | Ozone NAAQS (.12 1hr=>.08 8hr) | X | |
| 1997 | Pulp & Paper NESHAP | | |
| 1999 | Regional Haze Rule | X | |
| 1998 | NOx SIP Call & Section 126 Petitions | X | |
| 1999 | Final Section 126 Petition Rule | X | X |
| 2003 | Stationary Reciprocating Internal Combustion Engine NESHAP | X | X |
| 2004 | Plywood & Composite Wood Products NESHAP | (no health benefits quantified) | |
| 2004 | Automobile & Light-Duty Vehicle Manufacturing NESHAP | (no health benefits quantified) | |
| 2004 | Industrial Boilers & Process Heaters NESHAP | X | X |
| 2005 | Clean Air Mercury Rule | X | |
| 2005 | Clean Air Visibility Rule/BART Guidelines | X | |
| 2006 | Stationary Compression Ignition Internal Combustion Engine NSPS | | |
| 2008 | Ozone NAAQS (.08 8hr =>.075 8hr) | X | |
| 2008 | Petroleum Refineries NSPS | X | |
| 2008 | Lead (Pb) NAAQS | X | |
| 2009 | Portland Cement Manufacturing NESHAP | X | X |
| 2010 | Ozone Reconsideration | X | |
| 2010 | NO2 NAAQS | X | X |
| 2010 | Existing Stationary Compression Ignition Engine NESHAP | X | X |
| 2010 | Indus'l, Comm'l & Institutional l Boilers & Process Heaters NESHAP | X | X |
| 2010 | Greenhouse Gases PSD and Tailoring Rule | (no health benefits quantified) | |
| 2010 | SO2 NAAQS (==> 1-hr 75 ppb) | X | >99.9% |
| 2010 | Portland Cement Manuf'g NSPS & NESHAP Amendment | X | X |
| 2011 | Sewage Sludge Incineration Units NSPS & Emission Guidelines | X | X |
| 2011 | Comm'l & Indus'l Solid Waste Incineration Units NSPS and Emission Guidelines | X | X |
| 2011 | Utility Boiler MACT NESHAP | X | >99.9% |
| 2011 | Mercury Cell Chlor Alkali Plant Mercury Emissions NESHAP | X | X |
| 2011 | Oil & Natural Gas Industry NSPS & NESHAP Amendment | (no health benefits quantified) | |

Table 1 shows that in 22 of those 28 RIAs, I found that a majority of the total benefits were due to $PM_{2.5}$ mortality co-benefits. In fact, $PM_{2.5}$ co-benefits were the *only* benefits, or accounted for more than 99.9% of the quantified benefits in 13 of those 22. Of the remaining 6, 4 did not quantify health benefits at all (yet most of those discussed $PM_{2.5}$ co-benefits qualitatively as well as direct benefits of the rule's targeted pollutants). This leaves just two of the 28 RIAs that were not specifically targeting ambient $PM_{2.5}$ yet did

not find that most or all of the quantified benefits were actually co-benefits due to $PM_{2.5}$. Overall,

- $PM_{2.5}$ health-related co-benefits have been relied on to create the benefit-cost case for regulations that were actually intended to address mercury, a host of other air toxics, ozone, regional haze, lead, $NO_2$, and $SO_2$.
- The trend towards almost complete reliance on $PM_{2.5}$-related health co-benefits has grown over time.

**In 2009, EPA changed its RIA calculations to vastly increase the levels of $PM_{2.5}$ co-benefits that it can attribute to non-$PM_{2.5}$ rules.**

As noted above, EPA has been increasingly relying on $PM_{2.5}$ co-benefits to produce a benefit-cost case for a host of non-$PM_{2.5}$ rules. However, in my review of RIAs, I also realized that EPA made a move in 2009 that greatly increased those co-benefits estimates – and did so in a way that I consider to have no scientific credibility. The co-benefits that EPA estimates for rules that are not targeting ambient $PM_{2.5}$ are calculated from very small changes in $PM_{2.5}$ concentrations that are already well below the safe level established by the $PM_{2.5}$ NAAQS. This is because those co-benefits are supposed to be computed only for incremental improvements beyond existing regulations, such as the existing $PM_{2.5}$ NAAQS. The $PM_{2.5}$ NAAQS imposes a maximum annual average ambient concentration of 15 $\mu g/m^3$, which the EPA Administrator deemed to protect the public health with an adequate margin of safety in 2006. That NAAQS is under review now, and EPA staff (with CASAC's concurrence) has stated that the lowest level that it may be revised to is 11 $\mu g/m^3$.[4] Nevertheless, in 2009 EPA suddenly started to calculate $PM_{2.5}$ risks <u>in its RIAs</u> down to the lowest level its air quality models predict, which can be as low as 4 or 5 $\mu g/m^3$. This results in risks being attributed to exposures that are far below the level of $PM_{2.5}$ deemed safe. As I will show, those increased risk estimates are very large. EPA is using those greatly inflated risk estimates to justify a wide range of regulations other than $PM_{2.5}$, even though it is not prepared to argue that those risks are credible enough to justify action in the form of an even-tighter $PM_{2.5}$ NAAQS.

**<u>Risk Estimates Have Been Nearly Quadrupled</u>**. This decision by EPA to calculate risks down to the lowest level that its models project, rather than just to the lowest measured level (LML) in the epidemiological study that serves as the basis for its risk relationship greatly increased EPA's estimates of $PM_{2.5}$ co-benefits in its RIAs. This large inflationary effect can be observed just by comparing EPA's baseline 2005 risk estimates in its 2010 $PM_{2.5}$ *Quantitative Health Risk Assessment for $PM_{2.5}$* – which does *not* extrapolate below the LML – to those in its post-2009 RIAs which *do* extrapolate below the LML. The former is being used the current review of the $PM_{2.5}$ NAAQS

[4] EPA, *Policy Assessment for the Review of the Particulate Matter National Ambient Air Quality Standards*. EPA-452/R-11-003. Office of Air Quality Planning and Standards, Research Triangle Park, N.C., April, 2011, p. 2-106. (Available at: http://www.epa.gov/ttnnaaqs/standards/pm/data/20110419pmpafinal.pdf.)

mentioned above, and in it, EPA estimates 88,000 deaths were due to $PM_{2.5}$ in 2005 based on an epidemiological study by Laden *et al.*[5] In its concurrent RIAs, however, EPA estimates fully 320,000 deaths due to $PM_{2.5}$ for the same year, the same estimated air quality, and using the same Laden *et al.* study.[6] The former is 4% of total annual US deaths of 2.4 million and the latter is 13% of 2.4 million annual US deaths. Notably, EPA is now using both of these contradictory estimates of baseline $PM_{2.5}$-related deaths simultaneously in different regulatory proceedings – EPA is using the smaller number of baseline deaths in its CASAC-reviewed risk analyses for the $PM_{2.5}$ NAAQS review, and it is using the larger number of baseline deaths in its RIAs that are generating the large co-benefits for non-$PM_{2.5}$ regulations, such as for air toxics regulations and for non-PM NAAQS, such as ozone.

Thus, with this single change in its RIA calculations, EPA has caused the estimate of total $PM_{2.5}$-related deaths to nearly quadruple, from 88,000 to 320,000. In effect, in 2009, EPA quietly "created" an additional reservoir of 232,000 $PM_{2.5}$-related deaths that it could continue to tap into in its future RIAs as co-benefits for the many non-PM clean air regulations that it will be proposing and promulgating in the future. The RIAs for the proposed Utility MACT and the Ozone Reconsideration are recent RIAs that benefited from the dramatic inflation of EPA's estimates of total $PM_{2.5}$ risks, as I will show next.

**Inflated Co-Benefits Estimates Are Being Calculated for Small Changes in Exposure to $PM_{2.5}$ that EPA Deems Safe.** The Cross-State Air Pollution Rule (CSAPR) that was promulgated in July 2011 is intended to help bring the nation into compliance with the present $PM_{2.5}$ NAAQS. The RIA for the CSAPR reports that in 2014 it will save up to 34,000 lives that would otherwise end prematurely due to $PM_{2.5}$ exposures, as compared to premature deaths in a baseline that did not even include CAIR.[7] One can think of this as a reduction from the 320,000 underlying deaths associated with 2005-levels of $PM_{2.5}$. Even if we assume that control measures between 2005 and 2014 additional to those of CSAPR would double the estimated lives saved that EPA attributes to CSAPR alone, EPA is estimating that there still will remain some 250,000 deaths due to $PM_{2.5}$ even after CSAPR has been implemented in 2014. It is from this remaining reservoir of "premature deaths" (still nearly 10% of all US deaths per year!) that EPA finds the 17,000 lives that it purports would be "saved" as a co-benefit of the Utility MACT, when it comes into effect in 2015 and mandates reductions of acid gases.[8] When placed in the context of such a huge pool of lives that still "could be saved" if $PM_{2.5}$ were to be 100% eradicated,

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[5] EPA, *Quantitative Health Risk Assessment for Particulate Matter*. EPA-452/R-10-005. Office of Air Quality Planning and Standards, Research Triangle Park, N.C., June 2010, p. G-2. (Available at: http://www.epa.gov/ttn/naaqs/standards/pm/data/PM_RA_FINAL_June_2010.pdf.)

[6] EPA, *Regulatory Impact Analysis (RIA) for the Final Transport Rule*, Docket ID No. EPA-HQ-OAR-2009-0491, p. 3. (Available at http://www.epa.gov/airtransport/pdfs/FinalRIA.pdf.)

[7] EPA, *Regulatory Impact Analysis (RIA) for the Final Transport Rule,* Docket ID No. EPA-HQ-OAR-2009-0491, p. 1. (Available at http://www.epa.gov/airtransport/pdfs/FinalRIA.pdf.)

[8] The benefits of the Utility MACT rule are calculated after having modeled full implementation of the proposed Clean Air Transport Rule, which was the proposed version of the final CSAPR. It is thus fairly similar to an analysis of benefits after accounting for the reductions expected from CSAPR.

it becomes apparent that the 17,000 lives of "co-benefits" is a small percentage change that reflects the small difference in $PM_{2.5}$ exposures offered by the Utility MACT. The RIA for the Utility MACT confirms that it provides not only a small percentage risk reduction, but that its comes from very low exposures, as Figure 1 below, copied from Figure 6-15 of the Utility MACT RIA, shows.

**Figure 1. Copy of Figure 6-15 from the Utility MACT RIA**[9]
(The dotted red vertical line has been added to identify the level of the current annual $PM_{2.5}$ NAAQS)

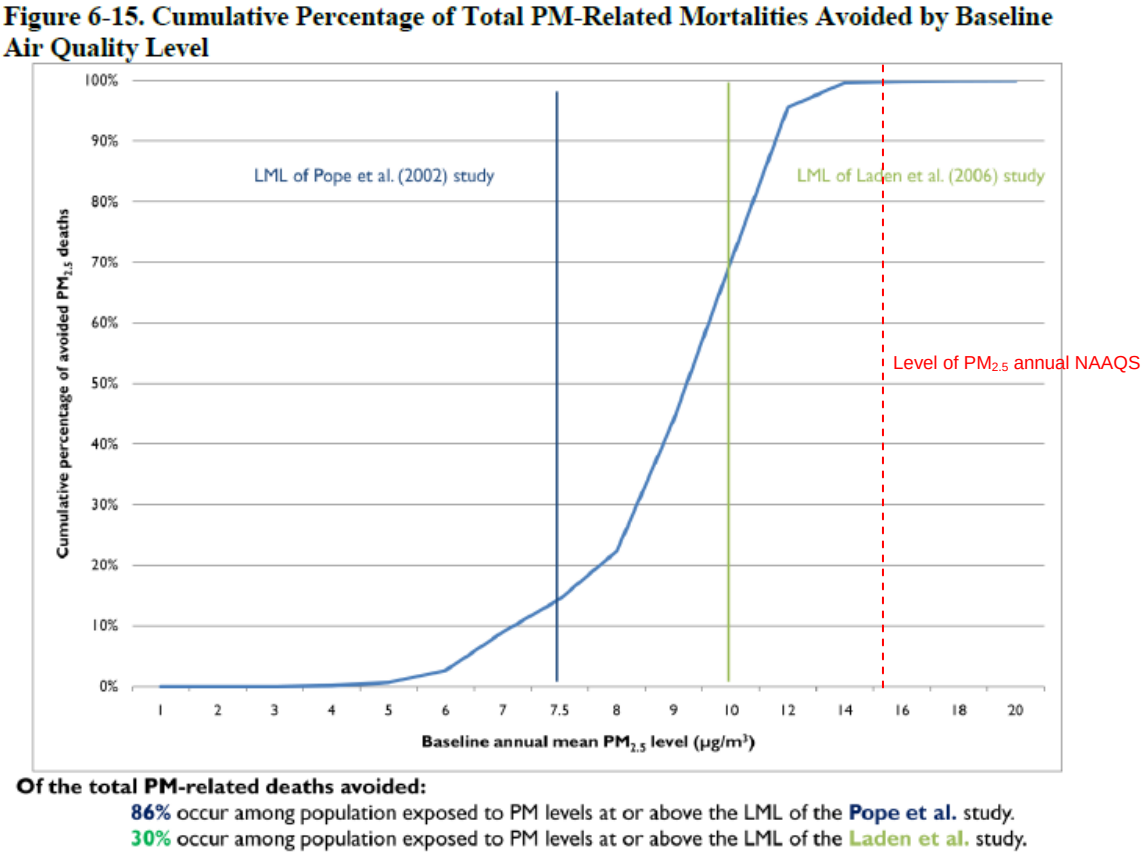


Figure 1 shows that effectively all of the Utility MACT's purported $PM_{2.5}$ co-benefits are due to reductions in exposures to $PM_{2.5}$ that are already below the annual NAAQS standard of 15 $\mu g/m^3$. This fact can be inferred from the figure in the following way. The blue S-shaped curve in Figure 1 indicates on the vertical axis the percent of the RIA's $PM_{2.5}$ co-benefits estimate that is attributable to baseline $PM_{2.5}$ exposures at or below the $PM_{2.5}$ concentration on the horizontal axis. This is known as a "cumulative

[9] EPA, *Regulatory Impact Analysis of the Proposed Toxics Rule*, Final Report, March 2011 (the "Utility MACT RIA"). (Available at: http://www.epa.gov/ttnecas1/regdata/RIAs/ToxicsRuleRIA.pdf.)

distribution." The point on the horizontal axis where the S-shaped curve just reaches 100% indicates the level of baseline $PM_{2.5}$ at or below which *all* (*i.e.,* "100%") of the estimated $PM_{2.5}$ co-benefits occur. I have added a vertical dotted red line to Figure 1 at the level of the current annual NAAQS (*i.e.*, at 15 $\mu g/m^3$ on the horizontal axis). As one can see, the vertical reading on the blue S-shaped curve is about 100% at 15 $\mu g/m^3$, which means that about 100% of EPA's estimated $PM_{2.5}$ co-benefits from the Utility MACT would be based on reductions in annual average $PM_{2.5}$ exposures that are already below the health-protective level of the current standard. Not only are most of the benefits occurring at very low $PM_{2.5}$ exposures to start with, but RIA also tells us that they are due to very small exposure changes. The changes in exposure are only 0.7 $\mu g/m^3$ on average, and do not exceed 1.49 $\mu g/m^3$ in any location.[10]

EPA is presently considering whether to tighten the $PM_{2.5}$ NAAQS, with a Proposed Rule expected later in 2011. EPA is considering a range of possible alternative annual standards that extends as low as 11 $\mu g/m^3$. If EPA revises the NAAQS to the lowest of those levels, the RIA's figure also tells us that 20% of the co-benefits being attributed to the Utility MACT (*i.e.*, those that occur in locations where pre-rule $PM_{2.5}$ is above 11 $\mu g/m^3$) are going to occur anyway, as a result of NAAQS attainment.[11] They therefore are inappropriate to count as co-benefits of the Proposed Rule for air toxics – they should be counted as the direct benefits of the new $PM_{2.5}$ standard. Moreover, the remaining 80% of the Utility MACT's $PM_{2.5}$ co-benefits are for reductions in $PM_{2.5}$ exposures that will *still* be deemed safe by EPA.

**The Additional $PM_{2.5}$ Benefits Estimates Are Not Scientifically Credible.** The significant inflation in $PM_{2.5}$ health benefits that EPA has introduced into its RIA calculations since 2009 is accomplished by adding in benefits of the least credible sort because most of that increase is due to benefits estimates below – often far below – the levels of $PM_{2.5}$ that have been observed in the scientific studies that form the basis of the $PM_{2.5}$ health effects literature. Thus, overnight in 2009, in the course of preparing RIAs that are not subject to public peer review, EPA dramatically escalated its estimates of benefits for all of its RIAs. This had the most profound impact on its estimates of benefits in the vast swath of the US that has $PM_{2.5}$ concentrations below 10 $\mu g/m^3$: small changes in modeled $PM_{2.5}$ in these areas used to contribute nothing to the total estimated benefits of a regulation, but they now contribute as much as 70% of the co-benefits estimates (as can be seen in the case of the co-benefits in the Utility MACT RIA from Figure 1). EPA accomplished this enormous benefits inflation without changing the

[10] See Utility MACT RIA, p. 4-5, (at http://www.epa.gov/ttnecas1/regdata/RIAs/ToxicsRuleRIA.pdf.)

[11] Some might argue that these $PM_{2.5}$ benefits will appear sooner because the Proposed Utility MACT Rule will be fully implemented by 2016, while full implementation of a tightened $PM_{2.5}$ NAAQS will be several years later. However, that difference is only temporary, and many have argued that the accelerated time frame for implementation of the Utility MACT rule will be far more disruptive than EPA's cost analysis indicates due to its exceedingly rapid implementation. Thus, making a point that these could be considered valid *temporary* co-benefits for the years 2016 through perhaps 2020 only raises the question of whether that accelerated time frame is reasonable and justifiable.

epidemiological studies it relies on, but by altering a much more obscure assumption in its risk analysis calculations, the use of the "LML".

One associated and interesting effect of this benefits inflation, however, is the degree to which it makes the total number of deaths attributed to $PM_{2.5}$ implausible. EPA's presumption that fully 320,000 deaths in the U.S. were "due to $PM_{2.5}$" in 2005 represents over 13% of all deaths in the U.S. *on average.* And behind that average is the presumption that in large expanses of the Eastern US, between 16% and 22% of all deaths in 2005 were "due to $PM_{2.5}$". By extension (although EPA has not reported this calculation), EPA's estimates imply that about 25% of all deaths *nationwide* were due to $PM_{2.5}$ as recently as 1980.[12] These fundamental assumptions that underpin EPA's co-benefits calculations stretch the bounds of credibility, and thus undercut the credibility of all the co-benefits estimates themselves.

The simple reason why these new baseline risks are so large – implausibly large in my view – is that EPA assumes in its risk analysis calculations 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 implication of 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.

**The decision to inflate the $PM_{2.5}$ risks by presuming risks continue down to zero has its greatest impact on co-benefits estimates.**

The vast increase in total deaths that EPA now attributes to $PM_{2.5}$ exposures (*i.e.*, the increase from 88,000 to 320,000 for the year 2005) has a greater inflationary effect on estimates of co-benefits from rules that do not address $PM_{2.5}$ risks directly than it does on the direct benefits of rules to steer ambient $PM_{2.5}$ into attainment of its NAAQS. In rules not targeting ambient $PM_{2.5}$ directly, the changes in $PM_{2.5}$ are only coincidental and presumably incremental to attainment of the $PM_{2.5}$ NAAQS. Such changes are most likely to occur in areas that are either already in attainment or will be pushed into attainment by rules implementing the $PM_{2.5}$ NAAQS. In fact, coincidental and incremental reductions of $PM_{2.5}$ that could qualify as co-benefits from a non-PM rule *must* occur in locations that are already in attainment with the $PM_{2.5}$ NAAQS, or else those benefits are being double-counted, because they have already or soon will be counted as the direct benefits of the $PM_{2.5}$ NAAQS itself. Hence, by inflating its $PM_{2.5}$ benefits estimates with additional risk estimates of the least credible form, EPA has enhanced its ability to justify *non-$PM_{2.5}$* regulations through $PM_{2.5}$ co-benefits. The practice of basing the benefit-cost case for new rules almost solely on co-benefits rather than on direct benefits is troubling to start with, but this recent change in EPA's RIA

[12] See pp. 14-16 of my technical comments on the Utility MACT (at: http://www.nera.com/67_7412.htm).

benefits estimation methods now causes the bulk of the co-benefits that it estimates to be quite suspect from a scientific basis.

**If it were viewed as credible that such large effects exist below the level of the $PM_{2.5}$ NAAQS, the appropriate policy remedy would be to tighten the $PM_{2.5}$ standard, and not to regulate something else altogether in order to obtain those benefits through "coincidence."**

There remain many reasons to continue to have doubts about the causality in the presumed relationship between ambient $PM_{2.5}$ and mortality. These calculations continue to rely solely on statistical associations with little to no clinical evidence to support the causal interpretation of these correlations. Despite many efforts to provide statistical controls, the ability to tease out other explanations based on phenomena that are correlated with variations in ambient $PM_{2.5}$ levels remains elusive. Alternative explanatory factors may include traffic, noise, and even socioeconomic conditions that have not been possible to characterize fully with statistically useful data. Tighter controls on $PM_{2.5}$ may therefore not produce the benefits that EPA calculates even for reductions from levels of $PM_{2.5}$ that are in the ranges of concentrations that have been measured in the epidemiological studies. But to also assume that the presumed causal relationship remains in effect with equivalent potency down to essentially zero concentration levels is simply inappropriate scientifically.[13]

EPA and CASAC have not shown any willingness to argue for setting a $PM_{2.5}$ standard at those very low levels that have not yet been studied, even though there is a complete and thoroughly effective mechanism in the Clean Air Act that gives the Administrator the ability to protect the public health from such exposures if they really do pose risks as large as EPA assumes in its RIAs. EPA therefore should not continue its practice of reporting that regulations that do not address ambient $PM_{2.5}$ will have benefits that exceed their costs based on estimates of $PM_{2.5}$ risks that EPA is not prepared to directly reduce through the $PM_{2.5}$ NAAQS.

**Co-benefits from a pollutant that EPA already regulates should not be allowed to serve as the predominant benefit in an RIA for a rule that targets a different public health concern.**

EPA's use of co-benefits in its RIAs scares the public into believing that people will be dying in droves were it not for implementation of new rules on pollutants for which EPA has not actually identified any current public health risk. It gives EPA a shield to justify building a complex web of many different rules, when EPA could provide almost all of those purported health-protective benefits with just a single rule: the $PM_{2.5}$ NAAQS. That EPA does not take this simple, streamlined approach hints at the degree to which it

[13] For a more complete discussion of these points, see my technical comments on the Utility MACT RIA, pp. 19-20, pp. 35-36, and Appendix C, available at http://www.nera.com/67_7412.htm.

realizes that its co-benefits calculations do not reflect true public health risks. But also, it is just bad policy to promote the goal of further $PM_{2.5}$ risk reductions by way of expanding MACT rules for mercury, acid gases, metallic air toxics and by way of striving to attain tighter NAAQS for ozone, lead, $SO_2$ and $NO_x$. This cannot possibly result in a cost-effective path to addressing a nation's clean air needs.

## Appendix

### More Details from My Technical Comments on the Utility MACT and Ozone RIAs

I have described and discussed the key trends of concern that I have observed in my review of many RIAs, but I also would like to also provide the summaries of the specific issues that I found in the two RIAs for which I have written full technical comments. I believe that a recap of my summaries for those two individual RIAs may help illustrate the depth of the problems that are created by EPA's reliance on $PM_{2.5}$ co-benefits as the central feature of its benefits analyses for clean air rules that are not purposefully reducing $PM_{2.5}$-related health risks.

### Summary of Key Findings from My Review of the Proposed Utility MACT Rule.

This section is excerpted from my *Technical Comments on the Regulatory Impact Analysis Supporting EPA's Proposed Rule for Utility MACT and Revised NSPS (76 FR 24976)* which was entered into the Utility MACT docket as part of comments submitted by the Utility Air Regulatory Group (UARG). The full comments can be downloaded from http://www.nera.com/67_7412.htm.

- Although EPA reports that the Proposed Rule will produce annual benefits ranging from $53 billion to $140 billion, these benefits have nothing to do with air toxics at all.
- EPA's estimates of the direct benefits due to reduction of the air toxics that are the specific purpose of this rulemaking range from only $0.0005 billion to $0.006 billion per year[14] – less than .01% of EPA's total benefits estimate – and this is due to reduction of just one of the HAPs, mercury (Hg). EPA concluded it had no basis for estimating benefits from reduction of any of the other EGU HAPs.
- Effectively all of the $53 billion to $140 billion of estimated benefits is due to "co-benefits" from coincidental reductions of fine particulate matter ($PM_{2.5}$), a pollutant that is separately and independently regulated under the Clean Air Act (CAA) as a criteria pollutant.

[14] Stated in a more readable format, the range of benefits estimated for the air toxics is $500,000 per year to $6 million per year. The Utility MACT RIA's summary Table 1-3 incorrectly states the lower bound, and I am reporting the values from RIA Chapter 5 (Table 5-7), and in the Proposed Rule (at 24979).

- The $PM_{2.5}$ co-benefits lack credibility because almost all of that dollar value comes from exposures that are so low that EPA deems them safe and is expected to continue to deem them safe after completing its review of the current $PM_{2.5}$ health standard this year. Further, the reductions in exposure levels are very small, averaging only 0.7 $\mu g/m^3$ in annual average concentrations.[15]

- The $PM_{2.5}$ co-benefits also lack credibility because of a long list of well-documented technical problems with the way EPA chooses to calculate actual health risks from statistical associations that have not been reliably shown to reflect causal relationships. These causality questions are particularly pronounced with respect to individual $PM_{2.5}$ constituents such as sulfate, which is almost the only constituent accounting for the Proposed Rule's co-benefits.

- *Prima facie* evidence of the non-credibility of EPA's co-benefits estimates exists in EPA's baseline estimates of risk in this RIA: deaths that were "due to" ambient $PM_{2.5}$ exposures exceeded 20% in areas of the US in 2005. These co-benefits assumptions also imply that over 40% of deaths were due to $PM_{2.5}$ in parts of the US during the period 1979-1983 when $PM_{2.5}$ concentrations were approximately double those for 2005. These surprisingly high assumptions about baseline risk, which in my opinion stretch the bounds of plausibility, are the result of a single assumption change in 2009 in EPA's RIAs to extrapolate risks below the ambient $PM_{2.5}$ levels that have been studied, to as low as background (*i.e.,* nearly zero).
    - RIAs are not subject to peer review by EPA's Clean Air Scientific Advisory Committee (CASAC) or to a public comment period.
    - EPA has not made this assumption change in any of the risk analyses supporting its current review of the $PM_{2.5}$ health standard, which are subject to CASAC review.

- The $PM_{2.5}$ co-benefits estimates are virtually all tied to attainment of the Proposed Rule's MACT for acid gases, which is the one MACT category in this Proposed Rule for which EPA has not offered any evidence of health risk.

- Given that almost all of the co-benefits are solely attributable to the acid gas MACT portion of the Proposed Rule, there is no cost-benefit case for the remainder of the HAPs control requirements in the rule, whether their estimated co-benefits are included or not.

In light of the above points, which are further elaborated in the rest of my comments, I conclude that the lower bound of the $PM_{2.5}$ co-benefits should be zero, and that EPA's

[15] Utility MACT RIA, p. 4-5. To put this in context, the annual average standard (*i.e.,* the level protective of public health with an adequate margin of safety) is 15 $\mu g/m^3$, about 20 times larger. Even the maximum decrease in $PM_{2.5}$ projected under the Proposed Utility MACT Rule is only 1.49 $\mu g/m^3$ (*ibid.*).

upper bound $PM_{2.5}$ co-benefits estimate is just not credible. EPA has not even quantified any benefits for the HAPs themselves, other than a tiny benefit from Hg reduction.

More importantly, I conclude that EPA's argument that there is a strong cost-benefit justification for the Proposed Rule is inappropriate because it is based solely on a preponderance of co-benefits from a pollutant that is already regulated, and not an air toxic. Moreover, the estimate is almost entirely derived from changes in very low concentrations that EPA has deemed adequately protect the public health. In the meantime, EPA has not been able to quantify, or even clearly identify, any meaningful amount of direct benefits from the reductions in air toxics that this rule mandates. The maximum ratio of direct benefits to costs for all three MACT groupings is 0.0006-to-1, with a net loss of about $10.9 billion per year. Each individual MACT grouping appears to impose a net benefit-cost loss on the basis of its direct benefits only, and two of those groupings appear to impose net losses even if their share of the upper bound estimates of co-benefits is included in the net benefit calculation.

**Summary of Key Findings from My Review of the Ozone Reconsideration RIA.**

This section contains excerpts from the beginning and end of my report, "Summary and Critique of the Benefits Estimates in the RIA for the Ozone NAAQS Reconsideration," which was prepared for the American Petroleum Institute. The full report can be downloaded from http://www.nera.com/67_7390.htm. The excerpts below have been modified to fit the current document's figure numbering.

EPA's statements on health benefits from lowering the Ozone NAAQS grossly misrepresent what EPA is actually estimating as the potential benefits of reducing public exposures to ozone. If based on ozone benefits alone, not one of EPA's estimates of the benefits of reducing ozone to a tighter alternative ozone standard is as large as the costs of attaining that respective ozone standard – all cost more than the ozone benefits they might provide.

EPA's estimates of ozone benefits are less than their costs despite the fact that EPA has now escalated those benefits by always including benefits due to ozone-related mortality. EPA's science advisors (CASAC) found no "causal" link established between ozone and mortality during their deliberations, but EPA now presumes, as part of the reconsideration, a causal link between ozone and mortality risk. Despite this change that is unsupported by CASAC, EPA's net benefits estimates for ozone standards tighter than 0.075 ppm are all still deeply negative.

The only way EPA finds benefits greater than costs for a tighter ozone standard is to add in health gains from concomitant reductions in $PM_{2.5}$ that may occur while reducing ozone precursors – "co-benefits" that have nothing to do with ozone exposures. Thus, EPA's claim that tightening the Ozone NAAQS has greater benefits than costs has nothing to do with reducing risks from ozone. EPA also has inflated the magnitude of these co-benefits as part of the reconsideration through several specious assumption

changes. The Agency's inflated co-benefits assumptions during this reconsideration represent a change compared to those assumed in the original Ozone NAAQS review ending in 2008. Even with both ozone mortality benefits and $PM_{2.5}$ mortality co-benefits, a large fraction of EPA's net benefits estimates are negative.

Figure 2 illustrates the *Supplemental RIA*'s estimates of the net benefits of each of the alternative ozone standards (relative to the standard of 0.084 ppm) when no $PM_{2.5}$ co-benefits are included. Even using the highest estimate of ozone mortality benefit in the RIA combined with the lowest EPA cost estimate, the estimated net benefits of the 0.075 ppm standard are about -$4.5 billion relative to the 0.084 ppm standard while the yet-tighter alternative standards (*i.e.*, 0.070 through 0.055 ppm) have estimated net benefits ranging from -$8.8 billion to -$12.7 billion. If one treats the ozone-mortality association as non-causal, EPA estimates that the current ozone standard of 0.075 ppm would have net benefits of -$7.5 billion and the yet-tighter alternative standards of 0.070 through 0.055 ppm would range from -$18.8 billion to -$76.7 billion. In fact, if there is no causal relationship between ozone and mortality risk, the net benefits estimates for standards tighter than 0.075 ppm remain negative even with the inclusion of the *highest* of EPA's $PM_{2.5}$ mortality and morbidity co-benefits and using the low end of its cost range.

**Figure 2. Summary of Net Benefits of Each Alternative Ozone Standard Relative to Standard of 0.084 ppm for Ozone-Related Benefits Only (All Are Negative).**