Talking Points on Costs and Benefits of EPA's Proposed Reduction in the National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$

We estimate costs of more than $38 billion/year to attain the lower end of EPA's proposed NAAQS range (12/35 ug/m^3) by the end of year 2020 – more than $300 billion over the next 8 years. More than 680,000 U.S. jobs will be lost. These costs will be incurred in exchange for highly uncertain, perhaps near-zero, public health benefits. For more detail, see our "Briefing Paper on the Costs and Benefits of EPA's Proposed Reduction in the $PM_{2.5}$ NAAQS".

COSTS

The great majority of these costs (at least $35.7 billion/year) will ensue from existing Federal regulations and other on-the-books-but-not-yet-fully-implemented requirements that contribute toward attainment of the existing $PM_{2.5}$ NAAQS (15/35 ug/m^3)

- These costs will fall broadly across the economy: on industry, vehicle owners, electricity users, homeowners and others

- These huge costs won't get the nation to full attainment of the existing $PM_{2.5}$ NAAQS by the end of 2020. EPA has projected that counties including 6-17% of the U.S. population (20-50 million people) still won't meet the current standard by 2020, despite this massive projected compliance spending pursuant to existing requirements

- In the Regulatory Impact Analysis (RIA) for the Agency's proposed new, reduced NAAQS, EPA hasn't estimated the cost of existing requirements toward meeting the current NAAQS. Instead, EPA has focused only on the far lower incremental costs involved in meeting a tighter NAAQS after the current NAAQS is presumed to be met.

- We estimate the $35.7 billion/year cost of existing $PM_{2.5}$-related regulations and requirements by adding up OMB's cost estimates for each of the recent "major" Federal regulations for which EPA estimated the majority of benefits would stem from reducing $PM_{2.5}$. However, total costs toward attainment of the current NAAQS will be higher than these costs for major Federal $PM_{2.5}$-related regulations, including additionally perhaps:

    - $4 billion/year for $PM_{2.5}$-related *non*-major Federal regulations;
    - $5 billion/year for $PM_{2.5}$-related New Source Review requirements that restrict growth in both $PM_{2.5}$ attainment and nonattainment areas; and
    - $5 billion/year for the thousands of State and local government $PM_{2.5}$ SIP requirements.

    In total, costs for all existing PM2.5-related requirements might be about $50 billion/year. In our analysis, though, we use only the $35.7 billion/year figure for major Federal regulations because: a) This figure is directly traceable to EPA and OMB; and b) We want our analysis to be conservative.

We estimate that it will take an additional $2.4 billion/year to attain EPA's proposed new, lower NAAQS in 2020, including $1.25 billion/yr beyond existing requirements in order to attain the current standard fully, and then $1.15 billion/yr more in incremental costs to improve from the current NAAQS to the proposed reduced NAAQS

- These additional costs are highly uncertain. In somewhere between 15% and 60% of the counties where further efforts beyond current requirements will be needed to attain the current NAAQS, EPA projects that these needs will exceed the capabilities of known control technologies and strategies. In these counties, all known control measures will be exhausted before the current NAAQS is attained. EPA assumes then that new control approaches will appear in whatever quantity is needed, that they will cost a flat $15,000 per ton, and that they will be capable of implementation sufficiently far in advance to yield attainment with the current NAAQS and any tighter NAAQS by 2020. We disagree. At a minimum, any new control technologies that might emerge are likely to be more costly than the more expensive existing known control measures. Current experience in "extreme" nonattainment areas perhaps suggests what costs might be for EPA's as-yet-unknown new technologies – for the most recent two years of data, PM_{10} offsets in the South Coast Air Quality Management District (CA) have cost $133,000 to $210,000 per ton. $PM_{2.5}$ offsets would presumably cost even more.

- Another major uncertainty involves predicting what "base case" air quality will be in 2020 after all existing requirements are complied with, but without any new requirements or controls beyond those that are now mandated. Will much further progress be needed in 2020 beyond existing requirements in order to attain the current NAAQS or a tighter NAAQS, or will the nation be almost there in 2020? EPA provided very different answers regarding projected air quality in 2020 in the Agency's 2006 and 2012 $PM_{2.5}$ RIAs. In developing our estimates for the incremental costs (beyond existing requirements) of attaining the existing NAAQS and potentially lower NAAQS, we assumed "base case" air quality in 2020 at midway between what EPA projected in the 2006 RIA and what the Agency projected (over-optimistically, we think) in the 2012 RIA

JOB LOSSES

We estimate that the more than $38 billion/year in compliance costs to attain EPA's proposed reduced $PM_{2.5}$ NAAQS in 2020 will cause the loss of more than 680,000 U.S. jobs.

- This includes 108,000 jobs lost in economic sectors directly affected by $PM_{2.5}$-related requirements, 272,000 additional jobs among suppliers to the directly affected sectors, and 304,000 more jobs eventually lost through "induced" effects such as will result from reduced spending by workers who retain their jobs but with less take-home pay.

- We estimated job impacts in two steps:

    1. In a recent study, NERA Economic Consulting (2012) used their general equilibrium model to estimate the macroeconomic impacts of a large set of Federal regulations affecting the U.S. manufacturing sector. We adjusted the impacts estimated by NERA downward to reflect the smaller set of existing major Federal regulations that significantly affect $PM_{2.5}$.

2. We then used the IMPLAN® input-output model to estimate the job impacts that would ensue from the downward-adjusted NERA results.

PERMITTING REQUIREMENTS THAT SLOW ECONOMIC GROWTH

Sixty days after a new NAAQS is promulgated, the permitting requirements change automatically for all projects undergoing permitting at that time and for all future projects. EPA has not yet provided adequate and timely permitting tools (air quality models fit for this purpose), guidance (to model users and to states for implementation) and implementation rules for the existing NAAQS, much less for any tighter new NAAQS. Permitting deterrents to economic growth are particularly damaging now with an opportunity for a renaissance of our manufacturing sector with changes in the supply and demand for natural gas and liquids.

The proposed lower NAAQS will make much more difficult the demonstration required of new sources and major modifications in attainment/PSD areas to the effect that they will not cause or contribute to a violation of a NAAQS or PSD increment. With current annual average air quality for $PM_{2.5}$ in attainment areas often in the range of 8 to 12 ug/m^3, tightening the annual standard from 15 ug/m^3 to 13 or 12 ug/m^3 will sharply reduce the margin above current air quality but below the standard within which a source's increased to-be-permitted emissions must fit. A variety of costs will result: proposed new projects or operational changes that would contribute to economic growth will be canceled, downscaled or deferred; limited capital will be spent for economically non-productive emissions controls; progress will be slowed by permitting delays; and substantial funds will be devoted to paperwork.

The proposed lower NAAQS will result in more areas being declared as in nonattainment than would occur with the current NAAQS. The cost to a community of being in nonattainment with a NAAQS includes not only the cost of the controls that must be implemented to attain the standard, but also the economic losses from being subject to nonattainment new source review and transportation conformity requirements while in nonattainment.

BENEFITS

EPA greatly overestimates the health benefits that might result from lower ambient concentrations of $PM_{2.5}$. More than 98% of EPA's total estimated benefits consist of avoided premature mortality due to exposure to $PM_{2.5}$, with each supposed avoided premature death valued at $8.9 million. We suggest four improvements to EPA's benefits calculation methodology. Any one of these changes would greatly reduce estimated benefits, to levels that do not clearly exceed the costs for EPA's proposed lower NAAQS.

1. EPA selects two studies to generate lower and upper bound risk estimates, not using other published studies that find much lesser – and even zero – mortality risks from $PM_{2.5}$ exposure:

- EPA establishes a lower bound risk estimate by drawing a concentration response function (CRF) from Krewski, et al. (2009), and an upper bound risk estimate using a CRF from Laden, et. al. (2006)

- Other published studies have found no associations between long-term exposure to $PM_{2.5}$ and mortality risks (Lipfert, et al. (2000) and Enstrom (2005)).

- Other model results from EPA's selected studies where greater statistical controls have been applied for other possible influences on mortality rates show less risk. For example, including SO_2 as well as $PM_{2.5}$ in the risk model reduces EPA's assumed lower bound CRF by at least 2/3, resulting in an estimated impact of $PM_{2.5}$ on premature mortality that is no longer statistically significantly different from zero (Krewski, 2000).

- EPA still cannot demonstrate a "cause and effect" between $PM_{2.5}$ and mortality.

- EPA's lower bound benefits estimate should reflect the possibility that exposure to $PM_{2.5}$ does not cause any excess mortality.

2. EPA does not reflect in any quantitative way in the Agency's analysis the increasing uncertainty in claiming mortality benefits from reductions in $PM_{2.5}$ at lower ambient concentrations, where much of EPA's claimed mortality benefits occur.

- The Clean Air Act requires EPA to establish the NAAQS at a level that protects public health with an adequate margin of safety. EPA proposes to reduce the primary standard for $PM_{2.5}$ to an annual average somewhere in the range from 12 to 13 ug/m^3. Presumably, then, exposures to $PM_{2.5}$ that occur at concentrations below 12 or 13 ug/m^3, are therefore "safe", in EPA's view. However, for a new NAAQS of 12 ug/m^3, approximately 75% of the mortality that EPA estimates would be avoided due to this standard occurs among populations that would have been exposed at "safe" $PM_{2.5}$ concentrations of less than 12 ug/m^3 in the absence of the new NAAQS. Likewise, for a new NAAQS of 13 ug/m^3, approximately 80% of EPA's estimated avoided mortality occurs among populations exposed below this alternative "safe" level of 13 ug/m^3.

- There is growing statistical uncertainty when EPA calculates mortality benefits estimates at ambient $PM_{2.5}$ concentrations approaching the lower extreme of the concentrations analyzed in the epidemiological studies from which EPA selected the CRFs. There is a further, different sort of uncertainty when EPA extrapolates the relationships estimated in these studies to below the ranges of ambient concentrations evaluated in the studies. EPA makes no quantitative adjustments in the Agency's benefits estimates to reflect these uncertainties. Furthermore, EPA in our view wrongly asserts that the "lowest measured levels" (LMLs) in the underlying epidemiological studies are the low exposure concentrations facing the study populations at the time when the studies concluded, instead of the much higher concentrations prevailing over the earlier years when the study populations received the bulk of their lifetime $PM_{2.5}$ exposure.

3. In light of these methodological issues, EPA's estimates of mortality due to $PM_{2.5}$ exposure are astonishingly large when compared against aggregate national mortality statistics or other reference data. Fann, et al. (2012) (a group of EPA Air Office staff) have extended EPA's RIA methodology to estimate the total national reduction in mortality if the $PM_{2.5}$ concentrations prevailing in the year 2005 were reduced not just to the proposed NAAQS, but instead to near zero. We compared the number of deaths that EPA thus attributes to $PM_{2.5}$ against national mortality statistics for the year 2005 from the Centers for Disease Control and Prevention.

Despite the substantial scientific uncertainty in EPA's claims, to accept the Agency's projected $PM_{2.5}$ mortality estimates, one would have to conclude that $PM_{2.5}$ is responsible for the premature death of about:

- 30 times as many people as HIV/AIDS;
- 10 times as many people as motor vehicle accidents;
- 5 times as many people as diabetes; and
- 2 ½ times as many people as all forms of accidents (motor vehicle; air, water, rail and other forms of transport; falls; drowning; fires; poisoning, etc.), suicides, homicides, and medical/surgical complications combined.

By another calculation using EPA's chosen epidemiological study that provides the Agency's upper estimate CRF (Laden, et al., 2006), we find that EPA would estimate that $PM_{2.5}$ is responsible for 25.2% of all cardiovascular deaths. There are many important and broadly agreed-upon risk factors for cardiovascular illness -- smoking, diet, obesity, heredity, lack of exercise, and other illnesses (e.g., diabetes), to name a few. To accept EPA's methods requires concluding that $PM_{2.5}$ outdoor air pollution is responsible for about 25% of all cardiovascular mortality, a larger share than most of these acknowledged important cardiovascular illness risk factors.

In another set of comparisons, we consider the monetized value of the $PM_{2.5}$ mortality benefits that EPA estimates for the year 2020 in the Agency's report on "Benefits and Costs of the Clean Air Act":

- EPA's central estimate of the economic benefits of $PM_{2.5}$ reductions would exceed the projected GDPs of all but 10 countries in the world;
- EPA's high estimate of the economic benefits of $PM_{2.5}$ reductions would exceed the total GDPs of all countries except the U.S. and China; and
- EPA's estimate of the economic benefits of $PM_{2.5}$ reductions is equal to 10-28% of the total projected U.S. GDP in the year 2020.

In short, EPA's claimed mortality estimates and mortality benefit estimates for $PM_{2.5}$ are amazingly high in view of the very significant methodological questions about the accuracy of those projections.

4. EPA's estimated mortality benefits would decline sharply, perhaps by as much as 95%, if the Agency were to improve the analysis by estimating and valuing "statistical life-years gained" rather than "statistical lives saved"

- EPA estimates the value of mortality benefits by multiplying the number of statistical deaths avoided due to the proposed rule by the value of a statistical life (VSL), assumed at $8.9 million. This VSL figure is derived mostly from studies evaluating the wage premium paid to workers in hazardous occupations, where an occupational death results

on average in many years of lost life expectancy. In contrast, the premature mortality that EPA believes may result from exposure to $PM_{2.5}$ occurs mostly among populations with many fewer years of life expectancy remaining. It is not appropriate to apply a high VSL figure derived from studies on occupational mortality to a very different population where premature mortality involves much lesser loss of life expectancy.

- A better approach for monetizing the benefits of avoiding premature mortality would be for EPA to estimate the number of *life-years gained* as a result of the regulation and then multiply by the *value of a statistical life-year* (VSLY). This alternative approach has been recommended for regulatory analysis by the Office of Management and Budget, it has been used occasionally in the past by EPA, it is often used by other Federal agencies and by other countries, and it is the preferred practice in valuing mortality benefits in the United Kingdom.

- Depending on the particular VSLY that is chosen, this different approach to valuation would reduce the monetized benefits that EPA estimates for the proposed NAAQS by between 47% and 95%.

SUMMARY

In 2006, EPA sharply reduced the NAAQS for $PM_{2.5}$ from 15/65 ug/m^3, as it had been since 1997, to 15/35 ug/m^3. The Agency now proposes to reduce the NAAQS further, to somewhere in the range from 12 to 13 ug/m^3, while retaining the24-hour standard at 35 ug/m^3. We estimate conservatively that the nation will need to spend at least $35 billion per year[1] through 2020 in an attempt to attain the current NAAQS. EPA projects that even this massive spending won't be enough to attain the current NAAQS – some 20 to 50 million Americans will likely still find themselves living in nonattaining counties in 2020 despite this effort. Attainment of the existing standard will require an additional $1.25 billion per year, while attainment of EPA's proposed new, lower NAAQS will require a further increment of $1.15 billion per year.

If EPA reduces the $PM_{2.5}$ NAAQS as the Agency proposes, we estimate that more than 680,000 U.S. jobs will be lost due to compliance costs exceeding $38 billion per year through 2020. The effort to attain first the current NAAQS and then also the proposed new, lower NAAQS will be hugely costly, difficult and technologically challenging. In many areas of the country, all known control measures will be exhausted in the effort to attain the current NAAQS, and full attainment of the current or a reduced NAAQS will depend on EPA's assumed timely emergence of cost-effective new control technologies and strategies that currently do not exist.

The health benefits from further reductions in the NAAQS for $PM_{2.5}$ are highly uncertain, and could be near zero. We suggest four improvements to EPA's methodology for estimating mortality benefits, which constitute more than 98% of EPA's quantified benefits for the proposed rule. Any one of these changes would greatly reduce estimated benefits, to levels that do not clearly exceed the costs for EPA's proposed lower NAAQS.

[1] This figure represents the costs only for recent existing major Federal regulations for which at least half of monetized benefits derive from reductions in $PM_{2.5}$.

Industry believes that the country should not now reduce the NAAQS for $PM_{2.5}$ at a time when there remains nearly a decade of costly and difficult work to be done in attempting to meet the current NAAQS, with the outcome being uncertain. Industry believes that the nation should continue the large and complex current effort to attain the existing standard for several more years and then assess progress, and only then might it be appropriate to consider further reducing the standard.