

**Prepared Testimony of
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before the
Subcommittee on Clean Air and Nuclear Safety and
Subcommittee on Green Jobs and the New Economy
Committee on Environment and Public Works
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Mr. Chairman and Members of the Subcommittee:

I am honored by your invitation to testify today. I am Vice President of Charles River Associates, and an economist by profession and training. I will start with a brief word about my qualifications. My work for over 40 years has addressed economic issues in energy and environmental policy, I have published many papers in peer-reviewed journals dealing with design and economic impacts of those policies, and I was honored by the Association of Environmental and Resource Economists with their 2004 award for a “publication of enduring quality.” I taught environmental economics at the California Institute of Technology and economic theory at Caltech and Stanford University. My testimony today will address EPA’s recently released Second Prospective “Prospective” analysis of the costs and benefits of the Clean Air Act. My statements in this testimony represent my own opinions and conclusions and do not necessarily represent positions of my employer or any of its clients.

EPA’s “Prospective study” estimates future costs and benefits of Clean Air Act regulations that were in place as of 2005, plus assumed implementation of the CAIR rule that was vacated by the courts and will be replaced by the less flexible CATR. It is prospective in the sense that it projects future costs and benefits, out to 2020, of existing regulations. The EPA study does not, despite the title, include the Air Toxics rules announced yesterday or any other proposed regulations.

In the time since it was released, my colleagues and I have not been able to review the Prospective study completely and in detail. But even in that short time, we have identified ways in which the study is being misinterpreted; places where its findings are questionable; and also some valuable insights that have been inadequately emphasized by EPA.

Misinterpretations

1. The study provides no information about the likely costs and benefits of new regulations, such as the Air Toxics rule announced yesterday or greenhouse gas regulation.

It should be obvious that no study of existing regulations can tell us anything useful about the likely costs or benefits of new regulations, and that any suggestion that the Prospective study supports rules like yesterday’s MACT is incorrect. No matter how well such a study is performed or how large an excess of benefits over costs it finds for one set of regulations, that finding does not transfer to any set of different regulations. Studies of past regulations, however

well executed, tell us nothing about the costs or benefits of future regulations.

I would not make this obvious point except that EPA Assistant Administrator Gina McCarthy implied exactly the opposite in testimony before the House Energy and Commerce Committee where I also testified. She stated that: “EPA is starting to update its existing Clean Air Act programs in order to address greenhouse gas emissions. The Clean Air Act tools that we will be using to do so are exactly the same Clean Air Act tools that have been responsible for achieving dramatically cleaner air and important public health benefits at reasonable costs.” This is a classic non-sequitur.

If there were a direct connection between past and present regulations – for example if new regulations were only adding to requirements on specific sectors, or tightening limits on the same pollutants – then some generalization would be possible.¹ But the generalization would be quite the opposite of the spin being put on the findings of the Prospective study. The proper generalization is that under these conditions new regulations will have smaller benefits and higher costs than past regulations. If EPA takes the most cost-effective actions first, tighter regulations on the same sources must have smaller marginal benefits and higher marginal costs. Only if EPA chose extraordinarily inefficient control technologies in implementing existing regulations, and neglected the much cheaper control options that are to be implemented in new regulations, could anything else be true.

In most cases, new regulations are just different from the existing set. The new regulations on electric generators being considered by EPA -- CATR, MACT, ash-handling and water, and greenhouse gases -- are specific as to timing and content and quite different from the existing set of regulations studied in the Prospective report. This point must be obvious, but it is missed by anyone who cites the Prospective study in defense of new regulations.

2. The Prospective study does not support the conclusion that there will be a net increase in employment due to expenditures on pollution controls and replacement powerplants.

In the same testimony, Ms McCarthy also stated that “Over the past seven years, the Institute for Clean Air Companies (ICAC) estimates that implementation of just one rule – the Clean Air Interstate Rule Phase 1 – resulted in 200,000 jobs in the air pollution control industry” and quoted a Wall Street Journal Op-Ed by certain utility executives who stated that “Contrary to claims that EPA’s agenda will have negative economic consequences, our companies’ experience complying with air quality regulations demonstrates that regulations can yield important economic benefits, including job creation, while maintaining reliability.”

This is not the message that comes out of EPA’s macroeconomic analysis in the Prospective study. The scenario that is relevant to the claims Ms McCarthy cited is the “cost only” scenario. It is the scenario that would show net economic benefits and increased total jobs if the claims by organizations like PERI were correct. In this scenario, the EPA study unambiguously finds that there will be overall negative economic effects – lower GDP, consistent losses in real purchasing power, and reduction in the output of all industries except natural gas. If EPA had reported model results for labor markets, I am confident that they would have revealed lower wage rates

¹ EPA even points out that in the benefit-cost study that it has not addressed the issue of the cumulative effect of regulations on a single source.

and lower total worker compensation. These directly contradict claims from organizations like PERI that there would be job benefits from increased investment to comply with regulatory mandates even if they provided no environmental benefits.

3. Nothing in the Prospective study implies that environmental regulations will create or enlarge a U.S. industry making and exporting pollution control equipment.

Administrator Jackson made these claims about Clean Air Act regulations in a recent Greenwire interview, saying that “We should not miss out on extraordinary opportunities to supply the world with environmental technologies that are made in the USA.”

She misses the point that costly environmental regulations do not create industries producing pollution control equipment for export or domestic use. Regulations create a demand in the U.S. for that equipment, but leave it open to all to supply that equipment. At the same time, environmental regulations increase the cost of doing business in the U.S. relative to other countries. Thus domestic manufacturers of mandated equipment and its components are put at a cost disadvantage relative to competitors located in countries that do not incur the cost of regulation. The result is to shift the supply chain for pollution control and electric generation equipment offshore toward less regulated regions where companies are better able to compete in producing components for powerplants and pollution controls.² The result is that regulation increases demand for pollution control equipment but reduces domestic supply.

Moreover, unlike proposals for a carbon tax, Clean Air Act regulations do not allow for a “border adjustment” to offset higher domestic costs – in fact, the WTO explicitly prohibits such offsets for regulatory programs. So even if the goal is to implement an industrial policy, EPA is the wrong agency to choose to create one. A study by economist Michael Spence that was discussed in Sunday’s Business Section of the Washington Post³ confirms this point. Spence points out that what he calls the tradable sector – which includes manufacturing – has grown in output but not jobs, while the nontradable sector – principally government and health care – has provided the job growth. He then addresses the challenge of how to create U.S. job growth in the tradable sector – which means policies that improve the productivity of U.S. workers so that growth in output is not accompanied by increased outsourcing. EPA’s regulations increase costs and lower worker productivity, thus leaving U.S. workers even more vulnerable to competition from cheaper foreign suppliers. This is not to say that environmental protection should be abandoned, but it does imply that environmental regulations must be designed carefully and sparingly because they do make the task of spurring job growth and income equality more difficult.

4. The Prospective study does not show that the “Clean Air Act” toolkit is the best way to approach greenhouse gases or any other emerging environmental issue.

Climate change is such a different environmental, economic and policy problem that studies of application of Clean Air Act authorities to criteria pollutants give a false picture of the likely costs and effectiveness of using those authorities for greenhouse gases. Nothing resembling climate regulations was analyzed in EPA’s CAA study, and therefore all its costs were neglected.

² I discussed the evidence that this is already happening in renewable energy equipment in my testimony before this Subcommittee on February 15, 2011.

³ Steven Pearlstein, Good for GDP not good for workers, Washington Post, March 13, 2001, G-1.

Indeed, what we know about the costs and benefits of greenhouse gas regulations paints an entirely different picture than the conclusions of the Prospective study. There can be no significant health benefits in the U.S. attributable to EPA greenhouse gas regulations, even under EPA's own calculations – because EPA's own studies show that the change in global CO₂ concentrations attributable to the regulations will be miniscule. It is a drop in the bucket compared to the global emissions of greenhouse gases that would be responsible for climate change.

Yet, as EPA's own past studies have shown, greenhouse gas regulations will have a significant cost. We have been able to extend the analysis of pollution controls that I discussed in testimony before the Subcommittee on Green Jobs and the New Economy on February 15th to include the impact of greenhouse gas regulations affecting the electric power, energy-intensive, and refining industries. That analysis confirms the logical finding that regulation of greenhouse gases under the Clean Air Act would impose even higher costs than air, water, ash and mercury regulations. Even if EPA were to use a system of regulation that, like a carbon tax, would minimize adverse impacts, a tax that started at \$20 per ton of carbon would increase wholesale electricity prices permanently by an additional 35 – 40% percent, reduce average worker compensation by 1.4% (or \$700) in 2015 and cause losses in output of coal mining, electricity and energy intensive sectors – about the same order of magnitude as the costs estimated in the Prospective study, and for regulations that have vanishingly small quantifiable benefits for the U.S.

Moreover, as I discussed in my previous testimony, the Clean Air Act toolkit is a far less cost-effective way to regulate greenhouse gas emissions than a carbon tax or similar program that puts an economy-wide price on greenhouse gas emissions and avoids technology mandates and command and control regulations.

Questionable assumptions and findings

1. EPA has failed to provide a satisfactory account of how PM and ozone are causally related to mortality, thus putting in question its calculated mortality reductions that provide over 93% of direct benefits in 2010.

The reasoning behind EPA's finding that PM causes adverse health effects was fundamentally flawed, because EPA treated consistent findings of a statistical association between PM and health in epidemiological studies as implying causality. The first day of any class on statistical inference is normally spent pointing out that association does not imply causality. My colleague Dr. Anne Smith has examined this problem in detail, and my comments here are based on her work. A proper causality determination requires an understanding of the clinical mechanism that can be established through “a) controlled human exposure studies that demonstrate consistent effects; or b) observational studies that cannot be explained by plausible alternatives or are supported by other lines of evidence (e.g., animal studies or mode of action information).”⁴ Instead, EPA relied on epidemiological research that is highly variable in its conclusions, readily explained by plausible alternatives, and subject to systematic biases that arise from the data and methods common to all studies. Dr. Smith concludes that these epidemiological studies cannot be relied on to demonstrate causality in the sense stated in EPA's Integrated Science Assessment

⁴ Second Draft of the Integrated Science Assessment, Table 1-3, p. 1-29.

for PM.

Even if causality is assumed, EPA's methods of statistical inference build in a bias to overestimate the strength of the relationship between PM and health effects due to systematic biases in all the published studies that arise from the similar data and methods used in all of them.⁵ The systematic biases arise from use of the same datasets with measurement errors, inadequate treatment of confounding variables and effect modifiers, and the likelihood that one identified but harmless pollutant is only a proxy for the presence of another, potent pollutant.

These problems were identified by my colleague Anne Smith in her comments submitted on EPA's draft risk assessment for the PM_{2.5} NAAQS. Ozone mortality benefits are equally, if not more, questionable. Even EPA's science advisors (CASAC) have agreed that the presumption of ozone causing mortality risk is "not ready for prime time." (This was said on the CASAC teleconference call of Feb 18, 2011 regarding the ozone NAAQS reconsideration.)

The lack of an established causal relationship between PM and ozone and health outcomes is relevant to the benefit estimates in the EPA study because a) having any mortality benefit from PM and ozone reduction requires the assumption that those two pollutants are a cause of those health effects, and removing that single assumption reduces the Prospective study's estimates of benefits by 93% in 2010 and b) even if causality is assumed, EPA overestimates the magnitude of benefits because of the systematic biases in all studies of the statistical association between PM concentrations and health outcomes that it takes at face value. Moreover, the range of benefit estimates provided by EPA in the Prospective study also underestimates the real uncertainty about effects, because it fails to include all relevant published statistical findings. Dr. Smith estimates that if EPA has used the results from all published studies, including those that found a negative correlation, it should have concluded that there is a 15 – 20% chance that there is zero mortality risk from PM_{2.5}.

2. The methodologies used by EPA to estimate other benefits are also questionable, in particular visibility benefits.

There are many problems in the measurement of visibility benefits, but the recreational valuation is likely to suffer from a particular problem that Dr. Smith has analyzed.⁶ Her published paper on visibility estimates shows that recent estimates of visibility benefits are biased high by the classic mistake of failing to remind respondents of a budget constraint. Moreover, her own survey's follow up questions, which were not used by other studies, showed that much of the value expressed for "recreational" visibility improvement actually also includes respondents' values for "residential" visibility. This implies an overestimate of recreational visibility benefits and double-counting of residential benefits in the calculations EPA did for the Prospective study.

3. EPA adopts a number of assumptions that lead to a systematic bias downward in its direct cost calculations.

⁵ Anne E. Smith, PhD, Comments on the External Review Draft of EPA's "Risk Assessment to Support the Review of the PM Primary National Ambient Air Quality Standards" November 8, 2009.

⁶ Anne E. Smith "Methods and results from a new survey of values for eastern regional haze improvements." With M. Kemp et al Journal of the Air and Water Management Association, Vol. 55, Nov 2005, p. 1767-1779.

The EPA study was done with a “macroeconomic model” very similar to CRA’s. In fact, its lead developer spent several years working on CRA’s model before going to RTI to develop a very closely related one. Therefore, I and my colleagues are intimately familiar with the modeling approach. The major flaws in the macroeconomic study come from the calculations of direct costs and benefits that were transferred over from EPA’s separate study of direct costs and benefits, but a few findings do appear to come from improper specification of the macroeconomic model or possibly inadvertent dropping of some costs.

Unrealistic cost caps: A major source of underestimation of costs is EPA’s practice of assigning arbitrarily low cost caps to unidentified control measures that must be adopted in addition to those analyzed in order to achieve attainment. EPA imposes these cost caps both in the definition of the control measures that will be required to achieve air quality standards and in costing the remaining “unidentified measures” that will have to be adopted by states to come into compliance. These cost caps have no economic basis and are in fact lower than observed costs of measures already in place. In particular, EPA assumes a \$15,000/ton cap on costs of NO_x controls, despite data in its own report showing that the marginal cost of NO_x controls is already above \$25,000/ton in many areas and over \$40,000/ton for offsets in California. Since the unidentified measures will be in addition to the identified ones, it is unreasonable to assume that they will cost less – unless EPA is convinced that it has adopted unnecessarily costly requirements in its identified measures.

Learning curves: Direct cost estimates also assume aggressive learning curves that arbitrarily reduce costs over time in spite of a substantial literature and direct advice to the contrary from EPA’s science advisors. Costs of mobile source controls are almost certainly underestimated due to an assumption that learning curves eliminate 60% of on-road regulatory costs. In general, EPA selected the very high end of the range of learning rates suggested by its science advisors and ignored important recent studies suggesting that cumulative output is not a causal in reducing costs. EPA gives reasons for all its assumptions, but none are good enough to exclude the opposite (e.g. zero learning) as a reasonable alternative scenario to determine sensitivity to key results.

Hidden costs: EPA ignores the ways in which regulations have degraded attributes of vehicles and fuels that consumers value. Not controlling, in particular, for changes in acceleration, payload, VNH, cold starting, load capacity, refueling time and other “subjective” issues has led to underestimation of costs in previous studies of mobile source regulations. EPA’s failure to take into account the ways in which mandated fuels and vehicle technologies have degraded vehicle performance has been a major flaw in all studies of the costs of mobile source regulations, and EPA repeats those omissions in this study.

4. EPA’s macroeconomic model unreasonably assigns economic gains from regulation to the petroleum refining sector.

It is clear in EPA’s analysis that the petroleum refining sector has incurred substantial costs to produce cleaner burning gasoline and has little real-world opportunity to win markets from other fuels. Yet in both EPA’s scenarios, the petroleum refining sector has positive impacts! This appears to be a modeling problem, due to improper specification of what other goods are substitutes and complements for petroleum. The way that petroleum competes with other energy

sources and other kinds of consumption is described in EPA's separate macroeconomic report. In EPA's model, petroleum products substitute for other inputs in producing a "transportation good" so that as other goods, including motor vehicles, become more expensive, more petroleum is used. We have experimented in many ways with this formulation, and find that it fails to account for the fact that gasoline consumption is positively correlated with auto purchases, so that regulations increasing the cost of motor vehicles should lead to a decline in petroleum demand. It is also clear that petroleum competes directly with electricity in the EPA macroeconomic model, so that increases in electricity prices increase petroleum demand. This does not happen in the real world.

Costs to refiners of producing cleaner fuels appear to be missing from EPA's calculations. EPA states that these costs are included by raising the price of fuels to households. The resulting change in the composition of household expenditures will produce a small loss in utility, but if the only change made by EPA was an increase in "prices," the higher payments by consumers will flow to refiners and then back through stock ownership to households as additional income that can be used to restore consumption. It is only if the net cost increase is removed from the circular flow of payments – that is, treated as an increase in production cost, not as a tax – that the costs of producing cleaner fuels are fully recognized.⁷

5. In calculating macroeconomic benefits of reduced mortality, EPA assumes that changes in survival rates are the same for all age cohorts, leading to overestimation of the increase in the labor force attributed to reduced mortality from PM and ozone.

First, it should be noted that all the errors discussed earlier in EPA's treatment of the connection between PM, ozone and mortality transfers over into the macroeconomic modeling of health benefits. Moreover, almost all of the health effects included in the macroeconomic modeling come from reduced mortality attributable to particulate matter.

To incorporate health effects in the macroeconomic analysis, EPA assumed pollution-related illness and mortality proportionally reduce the representative households' time endowment (labor and leisure). This procedure treats PM and ozone mortality as an equal risk across all age cohorts. The data clearly imply that premature deaths are most likely to occur in the over-65 population, but the modeling assumes that the effect is the same for all ages by increasing the "time endowment" and labor force proportionately to the expected increase in statistical life-years. This leads to an overestimate of the increase in the labor force and therefore of the benefits of Clean Air Act regulations in the macroeconomic modeling.

6. EPA's model fails to address some important additional effects of Clean Air Act regulations, in particular those that will cause further economic harm by disrupting the geographic location of industry.

⁷ "Estimated household compliance expenditures associated with petroleum products are implemented as price adjustments to reflect higher motor vehicle fuel prices. The petroleum price adjustment is calculated to match compliance expenditures related to household transportation fuel use. For other transportation compliance expenditures, the household utility function is adjusted to require additional expenditures to achieve a given utility level. These adjustments reflect the additional automotive inspections, maintenance, and technologies purchased by households to comply with the Clean Air Act. Other unidentified household compliance costs not related to transportation (e.g. non-road related local controls) are treated as lump-sum reductions to household income."

An additional effect of future regulations will be to push existing concentrations of industry into non-attainment, thus halting expansion of manufacturing industries and either inefficient dispersion of manufacturing and supply chains to other (attainment) areas in the U.S. or to move overseas. This is another critical factor that will influence the impact of pending regulations that is not addressed in the Prospective study.

7. By using a 2005 forecast to define its baseline, EPA likely overestimates current and future levels of emissions and therefore also overestimates emission reductions from mandated control technologies.

There have been huge changes in energy and economic outlooks since AEO 2005, almost all bringing down energy use, economic growth and emissions; these affect the baseline for the report and on balance are likely to reduce the benefits of CAA regulations since slower growth will make many of the drivers of emission growth – and therefore emission reductions – smaller. Depending on what happens and is learned from Japan’s reactors, the future deployment of nuclear may be much different from what we expect. There are about 20 GW of nuclear capacity that have filed for license renewal and an additional 17 GW expected to apply – if this 37 GW is delayed or unavailable the premature retirement of coal-fired powerplants predicted by all studies of pending regulations will be even more difficult and disruptive.

Important insights from the macroeconomic analysis that EPA does not emphasize

There are several important insights that can be found in the macroeconomic analysis if the reader knows where to look.

1. There will be losers as well as gainers among industries and workers, even in the most favor scenarios.

Even the “compliance costs and health benefits” case in EPA’s macroeconomic study shows many industries suffering losses in output, from which it follows they are losing jobs. Right there we can see how biased a study or comment is when it only deals with jobs associated with producing pollution control equipment and new powerplants. All this is ignored in studies by PERI and statements like those by Ms. McCarthy and the utility executives authoring the Wall Street Journal op-ed .

Gainers and losers occur within industries as well as across industries. Power producers that have large fleets of nuclear, renewable and gas-fired generation that operate in competitive natural gas markets – like producers serving Maryland where I live – will take in much larger profits as compliance costs for coal-fired powerplants drive up the wholesale price of electricity. For a nuclear or renewable powerplant, every penny increase in the wholesale price of electricity is a penny of additional profit from each unit of electricity sold. The consumers in these regions, on the other hand, will pay every penny of additional cost incurred by their load-serving entities that buy competitively priced electricity. This is in addition to the price increases that all consumers in regions heavily dependent on coal-fired generation will see.

2. Diverting investment and household resources into pollution control does not create net additional jobs or output.

Even EPA finds that effects on labor markets are negative, whether or not health effects are included. The fact that compliance costs reduce real wages, and total compensation is mentioned only obliquely in the technical discussion of how EPA's model deals with the excess burden of taxation.⁸ If EPA did publish model results on wage rates and compensation, I am confident that its "cost only" macroeconomic scenario would show that wage rates and labor compensation driven down by Clean Air Act regulations.

3. You cannot simultaneously believe claims that green jobs increase total employment and EPA's estimates of macroeconomic impacts of improved health of workers.

The methodology and conclusions of the EPA macroeconomic analysis demolish any claims that environmental regulations will cause a net increase in jobs in the economy. The basis of the benefit estimates in the macroeconomic modeling is the (correct) assumption that sick workers cannot be replaced by unemployed workers to maintain the labor force and output; green jobs studies assume that all jobs producing pollution control equipment will be filled by the unemployed. If the EPA macroeconomic study adopted the green jobs assumption, it would find no macro-economic loss from increased morbidity because all the vacancies and sick days could be filled at no cost. Indeed, it would find more jobs being offered due to sick leave. If the green jobs studies adopted the macroeconomic study's correct representation of labor markets, they would have to conclude that on balance regulations and "green investment" cannot increase total employment.

4. Macroeconomic modeling shows how non-credible the direct benefit numbers are, even if we accept EPA's dubious definition of causality and the resulting calculation of added life-years.

The dollar value assigned to reduced mortality and morbidity in the direct cost study is grossly disproportionate to the estimated change in productive life-years. The detailed documentation shows that the full effects of reduced mortality on "time endowment" were incorporated in the macroeconomic modeling, including the welfare benefit of increased leisure. The calculations underlying the macro model shows those lost hours are only 0.57% of the total "time endowment." I find it absurd to assign a benefit of \$6000 per person per year from reduced mortality when .57% of annual worker compensation of \$50,000 is about \$300 and .57% of the total time endowment is roughly 2 days out of the year.

Conclusion

In total, these concerns make me skeptical about the astonishingly large numbers EPA cites for benefits in relation to costs. If these issues were dealt with in the benefit-cost and macroeconomic analysis, I believe that aggregate benefits would turn out to be a bit larger or a bit smaller than costs.

EPA admits that if mortality benefits are excluded, direct benefits only exceed costs by about a factor of 2. When biases in the estimation of costs and in the dollar valuation of other benefits like visibility are taken into account, costs and benefits in the aggregate are likely to be about the

⁸ 821 Report, p. 1-9.

same magnitude. This is exactly what critics pointed out about the First Prospective Report,⁹ and it leaves open the possibility that some environmental regulations did and will provide benefits greater than their costs. Because of this, EPA should break out the costs and benefits of each program to inform judgments about which did and which did not pass a cost-benefit test.

This is also the most important implication for future regulations. They need to be studied, each on its own merits, both by EPA and by the Congress. Whether or not future Clean Air Act regulations will provide net benefits to the economy will depend critically on avoiding excessive regulation in areas where there are not demonstrable benefits of the proposed actions.

Regulating greenhouse gas emissions is one such area, where EPA could impose costs as large as all the existing regulations included in the Prospective study while gaining negligible health and other benefits for the U.S. Attaining a positive benefit-cost balance also requires that programs be designed to provide the maximum flexibility for private decisions. In many cases, we have seen that the Clean Air Act toolkit as defined by the courts and chosen by EPA does not provide this flexibility. These problems can only be fixed by the Congress.

⁹ Randall Lutter and Richard Belzer, EPA Pats Itself on the Back, Regulation Vol 23, No. 3.