

**Prepared Testimony of
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before the
Subcommittee on Energy and Power
Committee on Energy and Commerce
United States House of Representatives**

**Hearing on EPA's Greenhouse Gas Regulations
and Their Effect on American Jobs
March 1, 2011**

Mr. Chairman and Members of the Subcommittee:

I am honored by your invitation to appear today to testify on EPA's greenhouse gas regulations and jobs. 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 the issue of job creation by means of more stringent environmental regulations, clean energy standards, and greenhouse gas regulations. I will use a study on EPA regulations that was released last month ("the PERI study")¹ as an example of how claims about "job creation" are based on an incomplete and distorted picture of the effects of regulation. 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.

¹ J. Heintz et. al., "New Jobs - Cleaner Air: Employment Effects Under Planned Changes to EPA's Air Pollution Rules," Ceres and Political Economy Research Institute (PERI), February 2011.

Summary

I discuss how a study of green jobs released last month by Ceres and PERI gives a biased and incomplete picture of the effects of regulation *and* of how jobs are created. I also discuss estimates made with CRA's MRN-NEEM model of the effects of EPA's proposed greenhouse gas regulations on energy prices, employment and competitiveness.

These regulations undeniably raise the cost of doing business. Tradeoffs must be made between economic costs and environmental benefits in designing regulations, and pretending there is no cost does not help those deliberations.

The PERI study and its like predict job gains because they leave out of their calculations all the jobs lost in the rest of the economy because of regulatory costs. Indeed, the logic of the PERI report implies that the greater the unproductive investment caused by a regulation, the greater its impact on jobs. The result is absurd because the 'logic' upon which it is based is nonsense.

Using CRA's models, even highly cost-effective greenhouse gas regulations plus the other pending regulations would increase wholesale electricity prices by 35 – 40%%, reduce average worker compensation by about \$700 per year, and shrink coal, electricity and energy intensive sectors of the economy. Using Clean Air Act Authorities to create a system of command and control regulations will cost far more, because they are designed by bureaucrats who know next to nothing about the circumstances of individual businesses. Therefore, their orders cannot possible lead to the same cost-effective solutions that managers would find for their own businesses when facing a price on greenhouse gas emissions.

What Is Wrong with Green Job Studies?

Five key points need to be made about the discussion of jobs and other economic impacts found in reports like those done by PERI:

1. The serious debate in environmental policy is about how the costs of new regulations compare to their benefits, and how to design the regulations to minimize cost, uncertainty and disruption. Claims that regulations that raise the cost of doing business will create new jobs are, at best, a sideshow. Such claims only distract attention from the difficult tradeoffs that must be made between costs and benefits. “Green jobs” is not a subject that leading economists have usually taken seriously enough to criticize in professional journals.² I hope that this neglect will change because studies like the one that I address today command far more influence in the political sphere than they merit analytically.
2. The experience of the past decade has proven that environmental standards or clean energy mandates will *not* create industries in the United States that will export clean technology to the rest of the world. To the contrary, the cost of such mandates is borne where they are imposed, but the equipment may well be produced by workers in other countries. For instance, in 2008 U.S. wind turbine imports were \$2.5 billion and exports were \$22 million; less than half the wind turbines installed in the U.S. in 2007 were manufactured by U.S. companies.³ China is becoming the world's largest manufacturer

² A notable exception is a profound critique by a former member of the Council of Economic Advisors and Dean of the Sloan School of Management at MIT, Richard Schmalensee, "The Costs of Environmental Protection" in *Balancing Economic Growth and Environmental Goals*, Washington: American Council for Capital Formation Center for Policy Research, 1994, pp. 55-80. The issues have not, unfortunately, changed much since then. See also a thorough and accurate critique by Morris, Bogart, Dorchak and Meiners, "Green Jobs Myths," University of Illinois Law and Economics Research Paper Series No. LE9-001

³ USITC, Wind Turbines: Industry and Trade Summary, Office of Industries, Publication ITS-02.

of wind equipment,⁴ and exporting that technology to the U.S. U.S. solar manufacturers, including some of the technologically advanced, are moving to China to manufacture the solar arrays.⁵ German experience has been similar; its huge subsidies for wind energy largely drew electric power from Denmark where the generation capacity had already been installed. And now Vestas (Denmark's largest wind producer) recently closed all or most of its Danish manufacturing, despite the large EU demand for such technologies.

- In contrast to these facts, PERI's calculations are critically dependent on the assumption that 100% of the equipment purchased with mandated investments will be manufactured in the United States.
3. The critical error, epitomized by PERI, and common to all the studies in the genre, is their failure to balance the jobs lost in the rest of the economy against those that may be gained as a result of the specific mandated investments.
- The PERI study calculates jobs associated with newly mandated pollution control equipment and new generation units that prematurely replace existing generation forced to retire by the regulations. It ignores the increase in the cost of electricity caused by this policy and the effect of that higher cost on household real incomes, wages, productivity, investment in other sectors and economic growth.

Two decades ago, Harvard economists Dale Jorgenson and Peter Wilcoxon found that pollution control expenditures required by the Clean Air Act reduced total productivity-

⁴ "With their government-bestowed blessings, Chinese companies have flourished and now control almost half of the \$45 billion global market for wind turbines. The biggest of those players are now taking aim at foreign markets, particularly the United States, where General Electric has long been the leader." Keith Bradsher, New York Times, Dec 14, 2010.

⁵ Edward L. Glaeser: Why Green Energy Can't Power a Job Engine - NYTimes.com
<http://economix.blogs.nytimes.com/2011/01/18/why-green-energy-cant-power-a-job-engine/?ref=business>

enhancing investment, raised costs to households and businesses, and reduced growth in labor productivity, wages and employment. Their study remains the classic example of how leading economists assess the economic impact of environmental regulation.⁶ It found that regulation requires investments in pollution control equipment, or in replacing powerplants without producing more electricity. These investments use resources that would otherwise have added to the economy's capacity to produce more goods and services. Both the real income of consumers and the rate of economic growth fall. Productivity growth is reduced because the industries being penalized by higher energy and environmental costs were those with higher-than-average rates of technological progress and productivity improvement. The effect of Clean Air Act regulations was to shift investment into less dynamic industries, thus reducing the overall rate of technical progress and productivity improvement. And lower productivity growth means lower growth in income and wages. Overall Jorgenson and Wilcoxon find that a 2.6 % reduction in GDP in the 80s was due to environmental regulation, and a full 3% by 1995 when the Clean Air Act Amendments are fully phased in.

Of course, any final assessment must balance environmental gains against the loss of economic output. Mandates may enhance public health, lower property damage, or preserve aesthetic values. And these gains are the reasons to consider them. The fallacy arises when the mandated change in the pattern of investment is mistaken for a source of net gains in jobs and output.

⁶ Dale W. Jorgenson and Peter J. Wilcoxon. "Impact of Environmental Legislation on U.S. Economic Growth, Investment, and Capital Costs" *U.S. Environmental Policy and Economic Growth: How Do We Fare?* (Washington, D.C.: ACCF Center for Policy Research, March 1992).

4. Green job studies have averred that environmental regulations and policies to reduce greenhouse gas emissions will help to bring the economy out of the recession;⁷ these claims are false. They have also claimed, with equal lack of economic logic, that greenhouse gas regulations will stimulate long term economic growth.⁸ All such assertions rest on one or more basic fiscal policy mistakes.

- First, they ignore the timing of proposed policies relative to the business cycle. One of the first principles of fiscal policy to counter recessions is to make sure that funds are expended quickly, and the most common political mistake is to authorize spending that will only hit its peak after the economy is well on the way to recovery. That mistake in timing means that the opportunity to help the economy out of the recession is missed, and that when spending does occur it fuels inflation and drives out other, more productive investments. New regulations on electric utilities fail this test. Even if the investments assumed by PERI did take place the expenditures would still largely be made after even pessimists think the economy will be well on the way to recovery. In that case, workers in the pollution control and electrical equipment industries will have to be drawn away from other jobs, just as the mandated investment will be drawn away from other areas where it would contribute to economic growth. The total result is no net job gain and an overall drag on the economy.
- Second, even if the expenditures mandated by EPA regulations were timely, the benefits of economic stimulus cannot be attributed to those regulations. As PERI

⁷ R. Pollin, H. Garret-Peltier, J. Heintz, and H. Scharber, "Green Recovery," Political Economy Research Center and Center for American Progress, September 2008.

⁸ *Ibid.*, Appendix 4.

itself admitted in its 2009 report, about the same job benefits can be expected to come from any additional stimulus spending, so that job benefits do not differentiate between different kinds of spending -- except to the extent that spending on industries with low labor productivity will create more jobs than spending on industries with high labor productivity. This kind of job analysis is a sheer waste of time and resources, because every proposal for more expenditure can make identical claims. Regrettably I have contributed to that waste. When I was chief economist in the Office of the Secretary of Defense we regularly produced estimates of the direct and indirect jobs "created" by defense spending – and they were huge numbers. We didn't mention that about the same number of jobs would be "created" by spending the same amount of money on infrastructure or any number of other procurement programs, and that any differences due to assumptions about labor intensity were largely in the noise. We knew that economists justifying other procurement programs were doing the same, so that on balance we did no harm and made sure DoD was part of the game. Now we are hearing the same claims being made to justify regulatory programs, even though the whole discussion is a waste of time because it cannot justify one kind of spending over another. In a slack economy, any increase in spending will create some jobs. The challenge in thinking about fiscal stimulus is to put that additional spending into the areas that provide the greatest return to the economy overall, and on purely economic grounds that is not through regulations that raise costs of doing business.

- A lesson that does emerge from PERI's work is that using environmental

regulations to promote job growth is at a very high cost per job. Taking PERI's total required expenditure on pollution control equipment and replacement generators and dividing by direct employment gives a result of \$314,000 per direct job. That is an extraordinarily high price to pay to employ one person for a year, when the average employer cost across all occupations (wages plus benefits) was about \$50,000 in 2010, with a high of about \$100,000 for management and professional occupations and about \$25,000 for service occupations. There are far more efficient ways to create opportunities than requiring U.S. businesses to bear a cost of \$314,000 in investment to create one job.⁹

5. Government mandates to invest in industries or types of equipment that it deems to be 'green' amounts to nothing less than adopting a kind of industrial policy; such a course will neither speed recovery from the recession nor meet the challenges of long term growth.
 - If the policy concern is recovery from the recession, and in particular to induce businesses to invest their accumulated retained earnings, the model is what Kennedy did in 1962. He provided a temporary investment tax credit that is universally recognized as providing both economic stimulus and a significant increase in investment and the rate of productivity growth. He avoided picking winners as green jobs and green industry policies would do, and let private business do what they are best at – finding the most productive investments for the economy as a whole. Mandating investments in pollution control equipment

⁹ U.S. Bureau of Labor Statistics, Employer costs per hour worked for employee compensation and costs as a percent of total compensation: Private industry workers, by major occupational group and bargaining unit status, September 2011. <http://www.bls.gov/news.release/ecec.t05.htm>

and replacing existing generating capacity cannot possibly achieve economic benefits as large or as long lasting as that temporary investment tax credit did.

- Once the economy recovers from the recession, we have to recognize that new environmental regulations cannot increase aggregate employment. Labor and capital employed in pollution control and replacing existing generation is not available for producing other goods and services in a fully employed economy. Although my colleagues and I are still in the process of modeling the impacts of impending EPA regulations, using a modeling system that is descended in the same line as the study I cited above, we have done enough studies of policies that increase the cost of power generation that I can use preliminary results to illuminate where and how EPA's new regulations will create losses throughout the economy that more than offset any gains for specific industries that receive new orders because of EPA regulations.

In the remainder of my testimony, I will discuss in more detail the errors and omissions in Ceres' green job estimates and preliminary estimates of economic impacts from an analysis of EPA's greenhouse gas and other regulations that my colleagues and I now have underway.

Errors and Omissions in Detail

The PERI study bases its calculations of direct and indirect jobs on unpublished data from CRA's NEEM model. These data were derived from a single scenario for air regulations that was

commissioned by Exelon Corporation.¹⁰ That scenario assumed low natural gas prices, perfectly functioning capacity markets and represented the effects of the CAIR regulations as proposed last year and the new proposed utility MACT. It did not address the impacts of other pending regulations affecting electric utilities, including full effects of the Clean Air Transport Rule (CATR),¹¹ water, coal ash, or carbon dioxide regulations. The combined effect of all these upcoming and uncertain regulations may create significant issues about electric system reliability not addressed in the Exelon report and even higher costs.

The PERI study did not include any effects of pending EPA regulations of greenhouse gases under the Clean Air Act, but in previous studies¹² PERI and CAP have claimed that limits on greenhouse gas emissions will also create large numbers of new jobs either by stimulating the economy or by causing the growth of new industries devoted to reducing greenhouse gas emission. These studies exhibited all the same errors and omissions found in the most recent study.

The study for Exelon claimed to incorporate provisions of CATR, but it in fact only represented impacts of the CAIR rule struck down by the courts, and in particular assumed that the trading program invalidated by the courts would still be implemented. Trading under CAIR would have greatly simplified the problem of maintaining reliability, making conclusions about reliability in the Exelon report suspect. The trading program would also produce a different distribution of pollution control retrofits across states, thus invalidating the conclusions of the PERI report about state-level impacts. Even with these qualifications, the treatment of reliability in the report

¹⁰Ira Shavel and Barclay Gibbs, A Reliability Assessment of EPA's Proposed Air Transport Rule and Forthcoming Utility MACT, December 16, 2010. Footnote 1 states that "This report was prepared by Charles River Associates for Exelon Corporation."

¹¹ Only the CAIR rule was included in the study, mischaracterized as CATR.

¹²

was insufficient to properly identify potential system-level reliability concerns. That is, the report did not include the kind of power flow modeling and uncertainty analysis used in the electric power industry to identify risks of service interruptions that could be greatly increased by a massive replacement program.¹³

Additionally, the report was not designed to address the full range of potential impacts of EPA regulations. It did not discuss the cost of providing reliable electricity supply under the new regulations and its conclusions have not been tested under alternative assumptions. The report considered only one set of assumptions about highly uncertain factors, which include but are not limited to natural gas prices, performance of capacity markets, and discretionary actions by EPA. Without examining alternative scenarios to determine whether different assumptions would lead to different conclusions, it is impossible to support robust conclusion about the likelihood of adequate capacity or the magnitude of likely costs.

In this report, CRA's NEEM model concluded that there would be significant retirements of coal-fired powerplants that would otherwise have remained in service for several decades as a result of the CAIR and CAMR rule. Replacing 39,000 MW of prematurely retired capacity¹⁴ and installing mandated pollution control equipment was estimated to involve about \$200 billion in utility capital expenditures between 2010 and 2015.¹⁵ PERI took these capital and (in a separate calculation) O&M expenditures, allocated them to purchases from specific industries, and then

¹³These risks were discussed extensively in hearings this year before the Colorado Public Utilities Commission on implementation of the Colorado Air Quality and Clean Jobs Act.

¹⁴ Shavel and Gibbs, p. 4.

¹⁵ These numbers were not reported in the published Exelon report, but were cited by PERI. The PERI report describes annual job creation between 2010 and 2015, but it is highly unlikely, even if all their other invalid assumptions were correct, that the \$200 billion investment would be expended evenly through 2011 and 2015. Since the rules are not yet final, orders are likely to be delayed and actual construction bunched up in the later years -- if indeed there is enough time to comply with the mandates by 2015 in any event.

expanded the direct output and job effects to indirect jobs with a simple multiplier calculation.

Neither the report for Exelon nor PERI discuss the impact of this massive increase in capital expenditures on the credit ratings and cost of capital for utilities, which will translate directly into increased costs of electricity and may make achieving this level of expenditures by 2015 more difficult than they assume. Moreover, neither report mentions the rate increases that consumers will suffer as a result of these mandated expenditures by utilities, even though those rate impacts are reported in the standard output tables from the NEEM model. And since only the electric sector NEEM model was used, no account was taken of how these price increases will affect the rest of the economy, the standard of living of households facing increased costs of electricity and other goods and services, or the reduction in investment elsewhere in the economy as net investment is diverted from other industries into pollution control and generation equipment to replace prematurely retired powerplants.

Net versus direct jobs

Any study that estimates only the jobs created by a policy is grossly misleading. This is a well-known and common error in the kind of multiplier analysis based on input-output tables that was done by PERI. PERI's study tries to work around this truth by mentioning the loss of a small number of jobs associated with operation of retired coal-fired powerplants, though I do not see where those jobs were deducted from their direct job estimates. In any event, jobs in coal-fired powerplants are the smallest part of the story. Why PERI did not include the decline in coal production and coal mining employment that goes along with replacing coal-fired generation with other energy sources is a mystery. But this too is only a small part of the story. The important story is that consumers will have less real income to spend, because of increases in the

cost of electricity and of all other goods that are produced by means of electricity. Worker productivity will rise more slowly, as investment is diverted away from productivity-enhancing investments, so that wages that employers can afford to pay will fall relative to what they otherwise would have been. Energy-intensive U.S. industries will lose market share to overseas industries not subject to these requirements, and will therefore shrink in size. These impacts will lead to job losses in all the rest of the economy, as the effects of more costly energy ripple through the economy.

A highly respected regional economist¹⁶ has pointed out that proper use of such models requires that both the positive and negative impacts of a proposed policy must be addressed. He gives an example of how looking only at positive impacts biases the results to find that any government expenditure will create additional jobs. A study by KPMG found that expanding a Chicago convention center would create a net 6000 new permanent jobs. When an academic economist redid the study using all the same assumptions as KPMG except for taking account of jobs displaced by the expansion and increased local taxes to pay for the project, she found a net loss of 348 jobs. Mills points out that the most common mistake in these job studies is assuming that the project is paid for by money from outside the region where it is built. He comments that "the zero-sum character of outside money multipliers should be taken into account in federal spending programs" because payment for those projects comes from within the U.S. economy. PERI makes the same error by examining only industries that receive the orders for pollution control and new generating equipment and ignoring where the investment comes from and how other industries are affected.

Ignores likelihood of renewable energy equipment being sourced overseas

¹⁶ Edwin Mills, "The Misuse of Regional Economic Models," *Cato Journal*, XII:1, 1993.

All of PERI's calculations assume that 100% of the investment mandated by new air regulations will be manufactured in the United States -- as will all of its components and raw materials. This assumption is manifestly incorrect, and the omission makes it likely that even PERI's calculations of direct jobs are grossly exaggerated. As discussed earlier, the U.S. has been importing a large share of its new wind turbine equipment, U.S. wind manufacturers are outnumbered in the global market, and U.S. solar industries are moving offshore, .

Jobs not a good measure of economic benefit

To be sure, by mandating the use of the newer, more expensive energy sources and pollution control systems, new air regulations would create some new jobs. The difficulty is that the number of these new "green jobs" must be offset by the number of other jobs that the regulations would destroy elsewhere in the economy. Calculating "net" jobs immediately leads into the problem of how "jobs" are counted. There are many different kinds of jobs, with different skills, working conditions, and most importantly pay. I have discussed how diverting workers into jobs that do not contribute to producing goods and services that people enjoy will simultaneously reduce the overall standard of living. It is also possible to play games with hours of work, as the French have led the way in doing. A French government seriously proposed to limit the work week for any individual to 32 hours in order to create 20% more jobs.

The entire job debate is further confused by the lack of a clear definition of a "green job." For example, how would one classify a job supporting coal-fired power with carbon capture, or nuclear generation? The indirect jobs contained in the PERI calculations include, for example, steel workers producing materials that go into pollution control equipment and turbines. But when a slab comes out of a steel mill, it could equally well be fabricated into a part for a

scrubber or a part for a coal-fired boiler. So when investment switches from building new coal-fired powerplants to building scrubbers, some number of steel workers find themselves in "green jobs" even though no one is doing anything different in the mill (and some lose their jobs because of higher energy costs and foreign competition). Regardless of these definitional concerns, however, the fact remains that workers in aggregate will face lowered earnings potential under a policy that pulls investment away from expansion of capacity to produce final goods and services and raised energy costs. The net effect of lower productivity also ultimately translates into overall losses in average household spending power, and into reductions in GDP relative to what they would be if no such policy were in place. I turn to those cumulative macroeconomic effects in my final comments.

Talk of "jobs" diverts attention away from the important problem of how much workers earn to a largely irrelevant activity of counting heads. The question that we address in CRA's modeling of economic impacts is whether the balance of the many economic effects of EPA regulations is to increase or decrease total labor income in the United States, and the answer is that total labor income will decrease. The difference between our findings and PERI's estimates of large numbers of green jobs arises because the latter estimates are answering only half of the question about net jobs. Those who claim there will be a job-creating attribute to a policy such as new air regulations have asked whether it will require workers to build and install pollution controls and build and operate power plants that replace prematurely retired units. Of course it will, but the remaining question is what will happen to employment in other industries, some of which are directly targeted by the regulations – such as fossil fuels production – and some of which will shrink because consumers can no longer afford their full production.

Economic models can do a good job of determining whether total worker compensation will rise or fall; how this will be divided into "jobs" is conceptually vague and practically very uncertain. Therefore, in our macroeconomic studies of costs and benefits of environmental regulations we have decided to stop reporting jobs altogether, and rather report whether total wage payments have gone up or down. That total can fall because wages decline, the number of hours worked declines, or both. It is not possible to distinguish which would happen with any degree of precision.

If green jobs are lower-paying than the jobs they replace and require more labor per unit of output, that will just magnify the generally depressing effect of the environmental regulations on total labor income. Shifting expenditures to pollution controls and new generation might lead to two low-paid workers moving out of unemployment while one worker who was earning more than twice their wages became unemployed. Only if this were to be the predominant pattern of the impact of the policy could one argue that there would be a net increase in total jobs under the policy concomitant with the inevitable decrease in total payments to workers.

The Luddite Fallacy

There is another basic fallacy in chasing down which industry has the highest number of jobs per dollar of output, as in PERI's claims energy efficiency has 2.5 times as many jobs per dollar as oil and gas. I call it the Luddite fallacy, remembering the radicals during the early industrial revolution in England who went around smashing machines because of their belief that machines put laborers out of work. What we have learned over the ensuing two centuries is that capital deepening – increasing the amount of capital per worker – is a major driver of economic growth and of increasing productivity, and that having more output per worker is the reason that living

standards of workers have risen so dramatically in the past 100 years. Indeed, we measure productivity increase as the rate of increase in output per worker.

Studies like those done by PERI conceal their glorification of low labor productivity by talking about favoring industries that employ more workers per dollar of output. But driving the economy toward industries with more workers per dollar of output is a choice to favor industries with lower labor productivity over industries with greater labor productivity. Reducing average labor productivity translates directly into lower output and slower economic growth, since the basic equation for economic growth is that growth in income is the product of the rate of increase in labor productivity times the rate of growth in the labor force. Moreover, since wages are set by the marginal productivity of labor, shifting to industries with lower labor productivity leads directly to lower wages. This is exactly the point made in rigorous fashion by Jorgenson and Wilcoxon.

Jobs are simply not a relevant measure of economic benefits. Indeed, the more workers it takes to produce something, the more it will cost and the less of it the nation will be able to afford.

There is an opportunity cost to diverting the labor force to producing pollution control equipment and replacing useful electric powerplants. Labor is a scarce resource and diverting labor to less productive activities harms workers first, by causing wages to fall, and further limits what the economy overall can produce.

Reductio ad absurdum – the higher the cost, the greater the benefit

The simple multiplier model used by PERI assumes no change in relative prices and no opportunity cost of diverting capital and labor from other uses. The results of its calculations are very predictable and linear. If an investment of \$200 billion creates about 1.5 million jobs, then

an investment of \$400 billion would create 3 million, and on and on. The multipliers used by PERI would extrapolate gains forever. If PERI had used estimates of investment based on studies that find environmental regulations will be even more costly, it would have illogically concluded that such costly regulations would be even more beneficial to jobs, and by extension to the economy.

From this it follows that if EPA were to tighten the screws even more than under its current proposals, the result would be far more jobs. If compliance with EPA rules, or the cost of renewable generation equipment, were to rise above levels assumed to derive the PERI investment number, job benefits would increase again. This is clearly an absurd result, but it is the inevitable consequence of using an unsuitable approach -- simple multiplier analysis -- to address economy-wide changes in prices, supply and demand. Of course, this is because PERI's calculations ignore the increasing losses imposed on the rest of the economy and the drag on energy-intensive industries like iron and steel whose jobs will be moving overseas as production costs in the U.S. rise relative to competitors.

Preliminary Estimates of the Cost of New EPA Greenhouse Gas and Other Regulations

For this testimony, I have used CRA's full MRN-NEEM modeling system to provide preliminary estimates of the full economic impacts of the full set of impending EPA regulations that would affect the electric power sector, including greenhouse gas regulations under the Clean Air Act. This is still ongoing and precise results may change as we examine additional scenarios and alternative assumptions. Therefore, I will talk only in round numbers and emphasize the nature and direction of impacts, which I am confident are correct and robust results. I will provide the committee with a full report on these findings after our analysis and review are completed.

Again, the results may change in detail but I am confident that they will be quite similar to the preliminary results I can discuss today.

We have been able to extend the analysis I discussed in testimony before the Senate 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 like a carbon tax that 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.

The full MRN-NEEM modeling system incorporates the NEEM model used for Exelon, but it links that model to a full, state-of-the-art computable general equilibrium model of the U.S. economy.¹⁷ The computable general equilibrium model represents the full interindustry structure of the U.S. economy, accounting for the output of 15 industries, investment, consumption, wages and prices of all goods and services consumed by households. It is a dynamic model that traces out the growth of the U.S. economy from 2010 to 2050. Each industry is represented by a production function that determines the amount of labor, capital and natural resources required to produce a unit of output. The model solves for supply, demand and prices in every market, and determines the amount of investment that will be forthcoming given household savings behavior and the prospective return on investment. The model also takes into account the opportunity cost

¹⁷ This model has been described frequently in peer-reviewed publications, the most recent of which is S. Tuladhar, M. Yuan, P. Bernstein, W D Montgomery and A. Smith, “A Top-down Bottom-up Modeling Approach to Climate Change Policy Analysis.” *Energy Economics*, Vol. 31 (2009) Supplement 2.

of diverting labor and investment from one use to another.

The methodology used by PERI is based on no such model. Instead it uses a static "multiplier" to calculate the number of jobs in other industries required to support one job employed directly to produce and use pollution controls or new generating equipment. The PERI "model" is thus just a list of numbers, one for each industry. These multipliers have the following deficiencies, in comparison to a CGE model like MRN-NEEM.¹⁸

- They take into account none of the changes in the structure of the economy that will be induced by higher energy prices,
- They ignore the effects of higher electricity costs on the return on capital investment and willingness to invest
- They ignore welfare losses to consumers who are forced to consume less energy because of its higher price
- They completely ignore the opportunity cost of diverting labor and investment from one use to another.

Investment diversion and impacts on productivity growth

EPA's pending regulations would divert resources now used to produce goods and services into the task of producing pollution control equipment, replacing existing powerplants, and changing fuels and processes in industry. These mandates will raise electricity prices to consumers and

¹⁸ Other models of this type, that have produced qualitatively similar results to MRN-NEEM, include the Jorgenson-Wilcoxon model mentioned above and the Environmental Protection Agency's own ADAGE model. All these models would produce results qualitatively similar to those of CRA's model and the opposite of PERI's results.

businesses, leaving them less to spend on other goods and services causing decreases in demand for the quantities of goods and services produced by the economy. When labor and capital are diverted to uses that do not produce economic output, labor productivity must fall -- hours of work will remain the same or increase but the goods available for workers to consume will fall. Business activity is likely to contract relative to the levels that would have prevailed without policy-induced energy cost hikes. The demand for labor would weaken because employers would need to spend less on labor in order to supply the reduced amount of goods and services demanded by consumers. As a result, payments to labor are projected to decline relative to that which would have prevailed without the higher energy costs. This will be reflected in a combination of less employment, and lower wages for those workers not losing their job.

Impacts on electricity prices

Electricity prices will increase under the new EPA regulations, relative to what they would have been otherwise. Adding additional pollution control equipment and replacing fully depreciated powerplants will unquestionably drive up rates in jurisdictions with cost of service regulation, and higher costs of maintaining adequate capacity will drive prices up in deregulated generation markets as well.

The introduction to the recent PERI report implies that environmental regulations have no effect on prices by claiming that electricity prices have been stable in real terms since the CAA was introduced in 1970. This statement reveals clearly the errors that are propagated by failing to ask the question of what would have happened without those regulations. Prior to the Clean Air Act, electricity prices had been falling in real terms for decades, as improving generation technology and economies of scale drove costs down in real terms. The advent of environmental regulation

in the 1970s reversed that trend, as described in Paul Joskow's justly famous analysis¹⁹ and in the work of Jorgenson and Wilcoxon.

Competent analysis of the costs of regulation always involves constructing a reference case, without the policy to be analyzed, and comparing it to a case with identical assumptions except for the introduction of the policy. Results from such a comparison unambiguously and universally show that the policies analyzed by PERI increase electricity costs and rates.

Our preliminary analysis indicates that the full set of measures now proposed by EPA, including greenhouse gas regulations and the Clean Air Transport Rule (CATR), utility MACT, water, and coal ash regulations could increase real (i.e. before inflation) wholesale electricity prices by 35 – 40% from 2015 onward. Most of this impact is attributable to the greenhouse gas regulations.

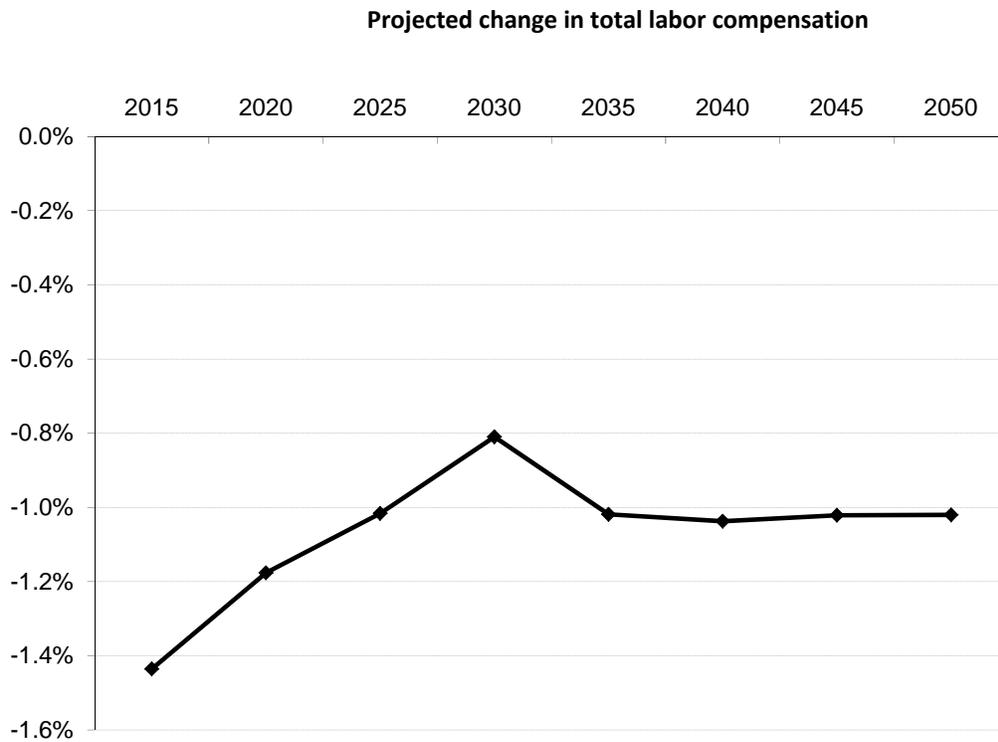
Net effects on employment and wages

Because these estimated impacts are based on the general equilibrium requirement that total payments to labor must fall to the new, lower level that can be supported by the reduced overall productivity of the entire economy, *they are necessarily inclusive of all increases in so-called “green jobs” that will be created as a result of the proposed legislation.*

We find that total labor compensation would fall by about 1.4% in 2015 under the cumulative impact of EPA regulations, higher electricity costs, reductions in industry competitiveness and lower worker productivity. This translates into a decline of about \$700 per year in average worker compensation, based on the BLS estimate of average compensation per worker of about \$50,000 in 2010. This decrease would become smaller as the shock of the immediate regulatory

¹⁹ P. Joskow, “Inflation and Environmental Concern: Change in the Process of Utility Price Regulation.” *Journal of Law and Economics*, XVII:2, October 1974, pp. 291-327.

onslaught, but the permanent effect would be the equivalent of a reduction of about \$500 per year in current compensation. The permanent impact on labor compensation is due to a slowdown in productivity growth resulting from the diversion of investment to comply with tighter environmental regulations.



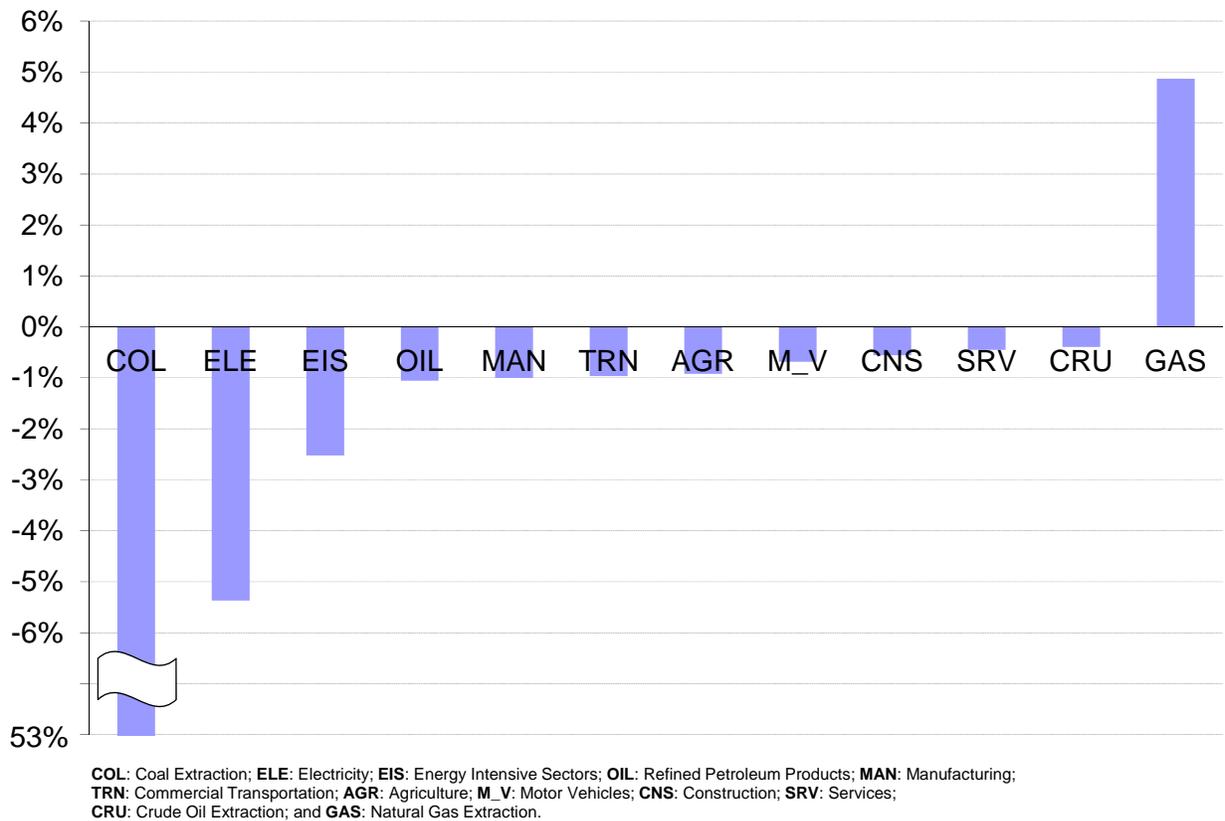
Source: CRA Model Results, 2011

Competitiveness of U.S. industries

Employment impacts will also vary by industrial sector and will largely be proportional to sectoral output in the short run. The graph below shows the change in output by sector that would be caused by the new EPA regulations including greenhouse gas regulations. Since proposed greenhouse gas regulations under the Clean Air Act apply mainly to electricity and energy intensive industries, we also find that the impacts are even more concentrated on coal mining, electricity, and energy intensive sectors. Coal mining declines as coal-fired powerplants

are retired, and electric output falls as higher prices drive demand down. Energy-intensive industries would be affected directly by greenhouse regulations as well as by higher electricity prices, making their competitiveness relative to other countries decline and demand for their products fall. Natural gas demand would rise significantly to replace coal, putting additional upward pressure on natural gas prices.

Projected percentage change in real output by sector in 2015



Source: CRA Model Results, 2011

Jorgenson and Wilcoxon also found that electricity and primary metals were the industries most affected (negatively) by the Clean Air Act Amendments of 1990, and that primary metals were the third most affected by prior environmental regulations (behind electric utilities and coal

mining).²⁰ They estimate that the effect of just the Clean Air Act Amendments of 1990 was to reduce output of the U.S. primary metals industry -- which includes iron and steel -- by about 3.5%, leading to a corresponding loss of jobs in the industry. This was the largest percentage impact on any industry, including electricity.

Moreover, even our estimates of impacts on energy intensive sectors on average are gross underestimate of potential impacts on specific subsectors like the upstream iron and steel industry -- blast furnace and electric arc furnace operations. We did a study several years ago of the effects of higher energy costs on the U.S. basic iron and steel industry. It revealed how easy it is to underestimate the magnitude of competitive effects of increases in electricity prices on a homogeneous commodity like steel that is traded internationally. When we analyzed impacts on the entire iron and steel industry, as conventionally defined, we found impacts of a \$40 carbon price to be about the same as the effects that Jorgenson and Wilcoxon attribute to environmental regulations through the Clean Air Act Amendments. But when we broke out the upstream iron and steel industry we found that over 40% of U.S. capacity would be forced to close immediately due to competition from overseas producers not subject to such cost increases.

Added Costs of Greenhouse Gas Regulation under Clean Air Act Authorities

Finally, regulation under the Clean Air Act is likely to take an even more costly course. Our analysis and that of just about every other modeling team has found that command and control regulations EPA must use under Clean Air Act authorities greatly increase costs above even the levels that carbon taxes or a cap and trade system would impose. The reason in simple terms is that command and control regulations are designed by bureaucrats who know next to nothing

²⁰D. Jorgenson and P. Wilcoxon, The Economic Impact of the Clean Air Act Amendments of 1990, The Energy Journal, Vol 14, No. 3, 1993

about the circumstances of individual businesses. Therefore, their orders cannot possible lead to the same cost-effective solutions that managers would find for their own businesses when facing a price on greenhouse gas emissions. So the result is that after the Congress decided not to create a cap and trade system, the EPA is following through with an approach that would impose far higher costs to achieve similar levels of emission reduction.

Conclusion

I will conclude with a quote from Professor Schmalensee's excellent paper, "As common sense suggests, we cannot regulate ourselves to prosperity." Thank you for this opportunity to address the Subcommittee.