
CLEAN AIR ACT AND JOBS

JOINT HEARING
BEFORE THE
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR
SAFETY
AND THE
SUBCOMMITTEE ON GREEN JOBS AND THE NEW
ECONOMY
OF THE
COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
ONE HUNDRED TWELFTH CONGRESS
FIRST SESSION
MARCH 17, 2011

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ONE HUNDRED TWELFTH CONGRESS
FIRST SESSION

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CLEAN AIR ACT AND JOBS

THURSDAY, MARCH 17, 2011

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY,
SUBCOMMITTEE ON GREEN JOBS AND THE NEW ECONOMY,
Washington, DC.

The subcommittees, met pursuant to notice, at 10 a.m. in room 406, Dirksen Senate Office Building, Hon. Thomas R. Carper, (chairman of the Subcommittee on Clean Air and Nuclear Safety) presiding.

Present: Senators Boxer, Inhofe, Carper, Barrasso, Sanders, Boozman, Baucus, Lautenberg, Cardin, Merkley, Vitter, Sessions, Alexander and Johanns.

STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Good morning, everybody. Happy St. Patrick's Day. Welcome to you all. What a beautiful day. What a great day. St. Patrick is smiling on us today and you could not ask for a lovelier day to hold this hearing.

We appreciate the effort of all of the witnesses to be with us today. I am especially delighted to be co-chairing this hearing with my colleague, Bernie Sanders.

Today's hearing is focused, as you know, on exploring the link between the Clean Air Act and the economy. Senators will have about 5 minutes for their opening statements and then we will recognize our panel of witnesses. Following the panel statements, we are going to have a couple of rounds of questions, maybe two rounds of questions, of roughly 5 minutes each.

The Government, as some of you have heard me say before, I think Government has many roles to play. I think one of the most important roles we have to play is to try to provide what I call a nurturing environment for job creation, job preservation.

In my State, and frankly in any State in this Country, if we have companies who are successful, they are playing by the rules, they are being good corporate citizens, they are making money, paying taxes, hiring people to work, people coming out of college and universities, out of high schools, off of welfare rolls, off of unemployment rolls, in my business, if you have all of that going for you, the rest is pretty easy. The role of Government is not to be the lap dog for business, but to try to provide a nurturing environment for job creation.

For the last 40 years, EPA has tried to do its part to enable the Federal Government to play that critical role. EPA has sought to foster economic growth while ensuring that Americans are protected from life threatening pollution including air pollution.

In 1970, President Nixon signed into law the Clean Air Act. This Act established a framework, as we know, to curb, among other things, our air pollution. This law was so successful that over 200,000 lives were saved between 1970 and 1990.

In 1990, President George Herbert Walker Bush built upon President Nixon's legacy with the Clean Air Act Amendments of 1990. That is the Act that gave us the clean air laws that we live with today.

Lately, some have sought to make the claim that the Clean Air Act has raised costs for consumers and hurt our economy. But on closer analysis, the facts tell a somewhat different story.

For example, since 1990, electricity rates, adjusted for inflation, have stayed constant in the United States while our Real Gross Domestic Product has grown by some 60 percent. At the same time, we have saved thousands of lives, tens of thousands of lives, and we have ensured that our children, along with their parents and grandparents, can breathe cleaner, healthier air.

For 2010 alone, cleaning up soot and smog saved over 160,000 lives. That is over twice the number of people who live where I live in Wilmington, DE. At the same time, our Country saved some \$1.3 trillion in healthcare costs by savings lives, reducing asthma attacks and reducing sick days. Put another way, Clean Air Act benefits outweigh the costs by a margin of 30 to 1. Talk about return on investment. It just does not get a whole lot better than that.

These clean air regulations help us save billions of dollars on public health costs while providing a multitude of opportunities for good paying American jobs. According to recent reports, clean air regulations that will be promulgated later this year are expected to create as many as one-half million new jobs over the next 5 years, jobs that come at a crucial time as our economy continues to recover and begins to grow.

These are American jobs in engineering, American jobs in design as well as in manufacturing, installing and operating pollution control and clean energy technology that is made in America and sold all over the world.

In closing, let me just leave us all with a quote from Harry Truman. President Harry Truman once said, and I am going to paraphrase what he said, he said that the only thing that is new in the world is the history we have forgotten or never learned.

In closing, I want to invite my colleagues to take a little time to actually drill down on what I believe are the facts with regards to the Clean Air Act. I believe that once they see the facts, they will come to realize that moving our country forward cannot mean going backward, certainly not on clean air.

That having been said, I want to recognize Senator Sanders, and then we will move to our Republican colleagues.

Good morning, Senator Sanders.

[The prepared statement of Senator Carper follows:]

STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE
STATE OF DELAWARE

Government has many roles to play. Among them, few are as important as creating a nurturing environment for job creation and job preservation. It is not government's job to be a lap dog for business; however, at the end of the day, if businesses large and small are making money, playing by the rules, being good corporate citizens, paying taxes and hiring people, the rest for somebody in my business is pretty easy.

For the last forty years, the EPA has tried to do its part to enable the Federal Government to play that critical role. The EPA has sought to foster economic growth while ensuring that Americans are protected from life threatening pollution, including air pollution.

In 1970, President Nixon signed into law the Clean Air Act. This Act established a framework to curb our air pollution. This law was so successful that over 200,000 lives were saved from 1970–1990. In 1990, President George H.W. Bush built upon President Nixon's success with the Clean Air Act Amendments of 1990. That Act gave us the clean air laws we have today.

Lately, some have sought to make the claim that the Clean Air Act has raised costs for consumers and hurt our economy. But on closer analysis, the facts tell a different story.

For example, since 1990, electricity rates—adjusted for inflation—have stayed constant in the United States, while our real gross domestic product has grown by 60 percent. At the same time, we have saved thousands of lives and ensured that our children—along with their parents and grandparents—can breathe cleaner, healthier air.

For 2010 alone, cleaning up soot and smog saved over 160,000 American lives. That's over twice the number of people who live in my hometown of Wilmington, DE. At the same time, our country saved \$1.3 trillion in health care costs—from lives saved, less kids getting sick with asthma and less sick days.

Put another way, the Clean Air Act benefits outweigh the costs by a margin of 30 to 1. Talk about a return on investment. It just doesn't get much better than that. These clean air regulations help us save billions of dollars on public health costs while providing a multitude of opportunities for good-paying American jobs.

According to recent reports, clean air regulations that will be promulgated later this year are expected to create as many as 1.5 million jobs over the next 5 years, jobs that come at a crucial time as our economy continues to recover and begins to grow. These are American jobs in engineering and design, as well as in manufacturing, installing and operating pollution control and clean energy technology that's made in America and sold all over the world.

In closing, I'd like to leave you with a quote from President Harry Truman, who once said, "The only thing new in this world is the history that you don't know." Let me invite my colleagues to take a little time and actually drill down on what I believe are the facts with regards to the Clean Air Act. I believe that once they see the facts, they will come to realize that moving our country forward cannot mean going backwards on clean air rules.

**STATEMENT OF HON. BERNARD SANDERS, U.S. SENATOR
FROM THE STATE OF VERMONT**

Senator SANDERS. Thank you very much, Mr. Chairman, and thank you to all our panelists for being here today.

Much of what Senator Carper just said I certainly agree with. This issue that we are dealing with today is important for several reasons. No. 1, I think it is important to rebut the argument that protecting the lives of the people of our country and the children through clean air somehow is detrimental to our economy. Second of all, the point must be made that as we move toward clean air, and do our best to make our air as clean as possible, our water as clean as possible, I believe that, in fact, we end of creating a substantial number of jobs.

Unfortunately, my Republican colleagues, or at least many of them, do not agree with that approach and are bringing forth legis-

lation which I think is very, very unfortunate and would do very serious harm to our country.

As I think many people know, the Environmental Protection Agency just this past week has announced a new standard to clamp down on mercury and arsenic and other hazardous pollution from powerplants. This standard will save, we believe, some 17,000 lives every year. One of the points to be made, and Senator Carper touched on this, everybody knows that there has been a very vigorous debate about healthcare in the United States of America.

We are concerned about the issues of obesity, we are concerned about drug addiction, we are concerned about tobacco. If you are concerned about keeping people healthy, out of the hospital, premature deaths, you are also concerned about the quality of air that our children are breathing and all of us are breathing, as well as the water we are drinking. It is a health-related issue.

As I mentioned, the EPA has announced a new standard to clamp down on mercury and arsenic. This standard will save some 17,000 lives every year, as well as thousands of heart attacks, hospital visits, asthma attacks and cases of bronchitis.

At the same time, the Political Economy Research Institute at the University of Massachusetts has found this standard, coupled with another standard meant to reduce pollution that travels from powerplants to downwind States, and I have to tell you, I take this personally in my State of Vermont. I visit schools very often. When you go into a school, you go in and see the school nurse and you say, how are the kids doing? Then she talks about the amount of asthma that exists in my State and our kids are breathing air that comes from the Midwest, not from the State of Vermont. We take that kind of personally.

In any case, the University of Massachusetts has found that the new standard, coupled with another standard meant to reduce pollution that travels from powerplants to downward States, including those in the Northeast, will create nearly a million and a half jobs over 5 years. Meanwhile, a study by Navigant Consulting Company in 2005, 2012, found air pollution will eliminate 360,000 jobs in downwind States.

This is what the big polluters do not want the American public to know. They have claimed for decades that the Clean Air Act kills jobs and destroys the economy. But the truth is that pollution is what kills people and kills jobs.

As Political reported in an article entitled Does Industry Cry Wolf on Regs, industry lobbyists predicted, quote, a quiet death for businesses across this country if Congress passed the Clean Air Amendments to reduce acid rain pollution in 1990. They were proven wrong, as a chart that we have shows, our economy grew by 210 percent since the Clean Air Act was passed in 1970. We created nearly 60 million jobs and at the same reduced air pollution 63 percent.

Let me just conclude. We are engaged here in a mammoth struggle, and that is whether we continue the progress, not enough, but what progress we have made in cleaning up our air and trying to make sure that our children do not come down with diseases which are absolutely preventable, at the same time, as Senator Carper just indicated, we have the opportunity to create a number of pollu-

tion control devices which can create good paying jobs as we keep our air clean.

So, with that, Mr. Chairman, I thank you very much.

Senator CARPER. All right, who is the Ranking Member here? Senator, do you want to go first? Who would like to go first?

Senator BOOZMAN. What I would like to do is ask unanimous consent, in the interest of time, to put a statement on the record and then yield to my Ranking Member, Senator Inhofe.

Senator CARPER. OK. Thank you. Is there any objection? I did not hear any. All right, thanks.

Senator.

**STATEMENT OF HON. JAMES INHOFE, U.S. SENATOR FROM
THE STATE OF OKLAHOMA**

Senator INHOFE. OK. Mr. Chairman, and I think that Senator Boozman and I both have the same problems in two other committees, so I will have to make a statement and have to be leaving.

But I do want to thank these great witnesses for showing up. You have a good group here and I appreciate the fact that you have held this.

I think we all embrace the significant air improvements that we have had from the Clean Air Act. Yesterday, on the floor of the Senate, I went back and kind of relived the history of this. There is, somehow, when people think that perhaps you are against some of the overregulation that is out there that you are against the benefits of the Clean Air Act, when in fact it has been a huge success. So, that is something that I think is very good.

I think that some of my colleagues and the Obama EPA believe that more regulations, even if draconian, necessarily mean more benefits and more jobs. I think, as David Montgomery of CRA International has shown from his written statement that it is just simply wrong. You do not have to take his word for it or my word for it.

But the testimony of Mayor Homrighausen, did I say that right? That is a tough one. Homrighausen. Well, all right. I want you to know that I used to have a hard job, too. I was the Mayor of a major city and, you know, if you are Mayor, there is no hiding place like there is up here. So if they do not like the trash system, it ends up in your front yard. Right? Well it did in mine.

So, anyway, I would say this. When I was Mayor of Tulsa, the major problem that I had was not prostitution, it was not crime, it was unfunded mandates. That is what we are looking at right now. As someone who has been considered many times in the ranking system as the most conservative member of the U.S. Senate, I have always said that in some areas I am a pretty big spender, national defense, infrastructure, something that we should be doing in our Committee, and I know that Senator Carper agrees with that, and unfunded mandates because these things are very, very expensive.

So, we invited the Mayor today because, as he writes his testimony, he is from coal country, straight from the heart of the industrial Midwest. There are 950 commercial, industrial and institutional businesses in Dover. So, the Mayor knows first hand that ill-conceived regulations can put jobs at risk. In other words, there is

a cost to what EPA is doing and it is to be borne in East Central Ohio and in communities just like it across the Nation.

I would say this, that, hopefully, help is on its way, Mayor, because we introduced yesterday the cumulative, the bill to have one place where you do a cumulative effect on the costs of these things, not just on business and industry but on our communities around the country.

All too often we have tried several times through the EPA to get the cumulative effect of all of these different things whether it is the various MACT bills or such things as ozone and others, what the cost actually is, not of each one individually but the cumulative costs of all of them. That is what we want to find out. I think we need to know what those costs are. That was introduced by Senator Johanns and myself yesterday. It is called the Comprehensive Assessment Regulations in Economy or CARE Act.

Now, I do not know where you are right now, whether you in your State, in your community, are out of attainment now in terms of ozone, perhaps you will cover that in your opening statement, and what would happen if you were to find yourself out of attainment. So, all of these things are very significant that we need to address.

We also, I have to mention the Inhofe-Upton Bill, which is referred to in the House as the Upton-Inhofe Bill, and it is pending right now, it is a regular order on the Floor, and it is one that, hopefully, gets a vote on, but it is one that would keep more burdensome regulations from our cities and towns and our States by returning the regulation of CO₂ to the Congress where we believe, and most Democrats would agree with me on this, it belongs, so that we can relive the EPA from that burden.

So, hopefully we will have a chance to get a vote on that sometime, hopefully today, and if not, as soon as we get back.

I thank you, Mr. Chairman.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE
STATE OF OKLAHOMA

I want to thank all of the witnesses for attending today, and thank you, Sen. Carper and Sen. Sanders, for holding this hearing.

I think we all embrace the significant air quality improvements achieved by businesses and other regulated sources under the Clean Air Act since 1970. I think we also agree that we want clean air progress to continue. Now here's where we disagree: on the extent, on the pace, and on the tools we use to achieve future success in reducing real pollution.

My colleagues and the Obama EPA believe that more regulation, even if draconian, necessarily means more benefits and more jobs. As David Montgomery of CRA International will show, this is simply wrong. But you don't have to take my word for it, or even David's: just listen to the testimony of Mayor Homrighausen from the city of Dover, Ohio.

You see, we invited the mayor today because, as he writes in his testimony, he's "from coal country," straight from "the heart of the industrial Midwest." There are 950 commercial, industrial, and institutional businesses in Dover. So the mayor knows first-hand that ill-conceived regulations can put jobs at risk. In other words, there is a cost to what EPA is doing—and it will be borne in east-central Ohio and in communities just like it across the heartland.

I should note that the mayor is also the director of the city's municipal electric system, Dover Light and Power. From what I've read, Dover Light and Power is under siege as it faces an overlapping mess of unrealistic EPA mandates. If they are not tempered by reality, Dover will have fewer jobs, fewer businesses, and higher electric rates.

Now, the mayor is very proud of Dover's environmental record, and he wants to make greater progress in reducing pollution. But his point is well-taken: EPA is doing too much, too fast. One point on which I'm sure he'd agree is that EPA has no idea of the cumulative economic impact of its regulations covering industrial boilers, coal-fired powerplants, coal ash disposal sites, and manufacturing facilities; it has no idea of their impact on Dover's jobs, Dover's local revenues, and Dover's factories.

Well, Mr. Mayor, help is on the way. Yesterday, Sen. Johanns (R-Neb.) and I introduced the Comprehensive Assessment of Regulations on the Economy, or CARE Act. The bill puts the Department of Commerce in charge of a Federal panel, comprised of several departments and agencies, which would conduct a cumulative economic analysis of all the rules you're concerned about. The panel must look at impacts on jobs, agriculture, manufacturing, coal, electricity, and gasoline prices—all of the things that you and mayors like you care about.

Help also comes in the form of the Energy Tax Prevention Act, also known as "Upton-Inhofe." It would stop EPA from regulating greenhouse gases under the Clean Air Act. Both this bill and the CARE Act will help put a stop to the Obama administration's harmful cap-and-trade agenda directed squarely at Dover, Ohio and the heartland of America.

Senator CARPER. Senator Inhofe, thank you so much.
Senator Cardin, Senator Ben Cardin of Maryland.

**STATEMENT OF HON. BENJAMIN L. CARDIN, U.S. SENATOR
FROM THE STATE OF MARYLAND**

Senator CARDIN. First, let me thank our Chairman, Senator Carper, for his real leadership on the area of air quality. We thank you. The legislation that you filed, I think, is an extremely important bill and we do look forward to coming together in response to Senator Inhofe.

I am glad to hear that we all support the Clean Air Act and Clean Water Act. I would hope that the common level we would all agree on is good science. Not what one side or the other says of science, but what good science takes us to. If we do that, then I think we can find a common ground here to make sure that the public health is protected and that our environment is preserved for our future generations. That is what I think we all really need to try to come together on.

I find some of the amendments that are on the floor and some of the bills to be threatening. Everyone is entitled to their own opinions, but we do need to have a common set of facts and I think good science helps us get to that point.

I really took this time to thank the panelists for being here, and particularly Paul Allen, who I know very well from Constellation Energy. Paul, welcome to our Committee. Constellation Energy is one of Maryland's leading, it is Maryland's leading energy provider, and Paul Allen has been a very active Maryland person in this regard. Constellation Energy is engaged in a variety of environmental stewardships and clean energy initiatives and as Constellation's Senior Vice President for Government Affairs and Chief Environmental Officer, Paul Allen is in the center of these important programs.

In looking at your resume, I now know why you have been so passionate in this. Mr. Allen started his career working for Senator Dodd. So, that was a good way to get started in understanding good policy.

Mr. Chairman, let me just point out that Maryland's experience as a downwind State motivated the Maryland Legislature and Gov-

ernor O'Malley to take firm, decisive actions to reduce mercury, SOx and OX emissions in our State by implementing the toughest powerplant emissions laws on the East Coast, the Healthy Air Act enacted in July 2007. It established the ambitious timetable of 3 years for Maryland's powerplants to meet a new set of robust clean air standards.

I must tell you, they are doing that. We are on target of meeting those standards. It has been the work of Constellation Energy and other major providers in our State that we have been able to do things that have achieved these reductions, which is going to be good for the health of Maryland and good for the health of people who live downwind from Maryland. It is not just our State.

In the process, it has created a lot of jobs in our State. A lot of jobs have been created as a result of the implementation of these policies. Constellation Energy, at the Brandon Shores coal-fired plant, the project invested \$1 billion and nearly 4 million man hours of labor from the Baltimore building and construction trade unions. This included 26 months of work of 2,000 skilled construction workers.

I point this out because I do think this is a win-win situation. We are creating jobs and providing cleaner air for the people of our State and leaving a cleaner environment for future generations.

I do not think we can turn the clock back. I really do think we need to move forward aggressively in this area. The State of Maryland is showing that we as a country can do a lot more. I know that Senator Carper and his work in Delaware has also shown similar actions, Senator Sanders of Vermont and all of my colleagues.

So I think the States are showing us that we can do a better job nationally with the Clean Air Act and we can provide cleaner air for the people of our community and I look forward to hearing from the witnesses.

But I, like Senator Inhofe, need to apologize. I have an amendment that I am going to be offering on the Small Business Bill before the Senate, so I am going to have to excuse myself.

Senator CARPER. We are glad you are here. Thanks very, very much for your comments and your leadership.

Senator Alexander, Lamar Alexander. Good morning, Lamar. Happy St. Patrick's Day.

**STATEMENT OF HON. LAMAR ALEXANDER, U.S. SENATOR
FROM THE STATE OF TENNESSEE**

Senator ALEXANDER. Thanks, Mr. Chairman. I forgot my green tie this morning.

Welcome to you all. Thank you for coming.

This is an important topic upon which a lot of us have been working for some time. Senator Carper and I, and I commend him for his leadership, have introduced over the last 6 years clean air legislation that last year, I believe, had 15 co-sponsors, an equal number of Republicans and Democrats and one Independent. The fundamental was, while we were arguing over what to do about carbon, let us go ahead and deal with SOx, NOx and mercury. That was the thesis we had because we have differences of opinion on carbon, on how to do it, and what to do, etcetera. It is a new big

subject for most Members of Congress and, for the country, even relatively new. But SO_x, NO_x and mercury are not new and we understand the dangers in all three and the bill that we had introduced requires a 90 percent reduction in mercury, which I believe science shows can be done at a reasonable cost.

So, I look forward to working with Senator Carper on clean air legislation and hope that in this Congress that it will be enacted.

Now, on the subject of costs, some say we deliberately need a high cost energy strategy. There is much talk about putting a price on forms of energy to discourage it. I am opposed to that. I think we need a low cost clean energy strategy. There are ways to do that. As Senator Carper said, what we have seen with the regulation of sulfur and nitrogen pollutants from coal plants since 1990, that has not added significantly at all to the costs of electric bill, or at least electricity has stayed stable in its costs.

So, once we figure out ways to get rid of pollutants that damage our health, and we are sensible about it and use common sense, we can use those new inventions and technologies to improve the cleanliness of our air without adding significantly to our costs.

Of course, we could just say ah-hah, we have a new invention here, let us impose it by next week and we could run the costs way up and there would be great damage to that. The damage would be that it would make it harder and more expensive to create jobs.

I am aware that in new inventions there is always some new jobs. We have some of that in Tennessee. I am glad to see the presence of Mr. Yann who is here from Knoxville. Alston has a presence in Chattanooga and Knoxville. They make pollution control equipment which is being used by TVA and others and they manufacture gas and steam turbines for nuclear power, which is 70 percent of our clean electricity today in the United States. So, I welcome them.

But what we want to do is make sure that we make it possible for them to come to Tennessee because in my experiences as Governor, recruiting industry, one of the most important aspects is lots of cheap, reliable, clean electricity. For example, the ALCOA plant, smelting plant that my father worked at in my home county is closed now because of a dispute between ALCOA and TVA over electricity costs.

The auto plants which have come to Tennessee and now are 35 percent of all of our manufacturing, look every day at costs. If costs go up too much, they go to Mexico or they go overseas. Electricity and power is one of their costs.

Even the polysilicon plants which have come to make the materials for solar, big expensive plants that hire a few hundred people, each of them, we have two in Tennessee, use 125 megawatts of power. That is not going to come from solar panels. That is not going to come from windmills. That is going to come from nuclear power, coal power or natural gas. Those are the only forms of electricity that we have right now that can produce large amounts of reliable, clean energy at a cheap cost.

So, it is very important that we go ahead and find ways to reduce the air pollution that we have. So I look forward to working on clean air in this Congress with Senator Carper and others. I want to emphasize that I would like to do it at a reasonable cost. I look

forward to reviewing the EPA's new mercury regulation to see whether it meets that standard and I thank the Co-Chairmen for their leadership in having this hearing.

Senator CARPER. We thank you for being a part of it. Senator Alexander and I have been wingmen on the issue of cleaner air, particularly when it comes to SO_x, NO_x and mercury for, as he says, a number of years.

I come from a State, as does Senator Sanders, where sometimes we feel we live at the end of America's tailpipe. We have a bunch of States to the west of us who generate electricity by burning, in many cases, coal, nothing against coal, we need coal, we need really clean coal actually, but put bad stuff up in the air and it just blows our way and we end up breathing it.

It is especially frustrating, Lamar mentioned the time he served as Governor and I was a little bit after him, but it is very frustrating when we are trying to meet our clean air requirements to stay in compliance with the guidance of the regs and so forth, and for us, I could literally have shut down Delaware to try to meet, to be in attainment on some of this stuff, and we still would have been out of attainment because the folks out to the west of us were putting dirty stuff in the air and it came our way. It is just not fair. We had to compete with these folks in terms of electricity costs. They are making cheap electricity, a lot of times created by coal, and we, it is just not fair.

I am a big believer in the Golden Rule, treat other people the way we want to be treated. But what we want to do is make sure that happens in this instance.

All right. Long introductions now for our panel members.

Paul Allen, you were sort of introduced in a left-handed way by Ben Cardin. Are you the same Paul Allen who founded Microsoft? Is that you?

Mr. ALLEN. [Remarks off microphone.]

Senator CARPER. Maybe you had the mail or again you will get the wrong dinner check to go to the wrong Paul Allen or, in your case, the right one. Just wanted to check.

All right. Barbara Somson. Is it Somson? Yes, Barbara Somson, Legislative Director of the United Auto Workers. Welcome. We used to have a lot of auto workers in Delaware. UAW represented Local 1183 at Chrysler and 435 at GM. The GM plant is coming back to life and we are going to be starting, late next year, to build a bunch of cars by Fisker, beautiful, beautiful luxury cars that get 80 miles per gallon. I suspect they are going to be built by some of your folks. That is good. We are looking forward to that.

All right. Now, we have here a guy from Dover. Dover, of course, is our capital.

[Laughter.]

Senator CARPER. I used to spend a lot of time in the capital of Ohio, Columbus. I was a Buckeye, Ohio State. I have actually driven through your city a time or two. So, we are glad the other Dover, the Mayor of the other Dover, is here. My understanding is that you pronounce your name Homrighausen?

Mr. HOMRIGHAUSEN. Homrighausen.

Senator CARPER. Hausen, hausen. Has anybody ever mispronounced your name?

Mr. HOMRIGHAUSEN. No.

[Laughter.]

Senator CARPER. OK. Just checking. Mayor of Dover, welcome.

Again, Ben has already given Mr. Allen a pretty good introduction. We are happy that you are here, Mr. Allen.

Next we have Mr. David Montgomery, Vice President of Charles River Associates. There is a Charles River that runs right through Boston, made famous in song. My son, Christopher, just graduated from school up there, used to run right along that river. We did it many times together. It is nice to have you here.

Finally, James A. Yann. Yann, right? Vice President, no, Managing Director of Alstom Power. We are happy to see you and welcome one and all.

Your entire statements will be made part of the record and if you would like to summarize, you may feel free to do that. But, actually, try to stick to about 5 minutes. If you run a little bit over, that is OK. But if you run a lot over, that is not OK. I will reign you back in.

Ms. Somson, why do you not lead these guys off, OK?

Thanks, and we are glad you are all here.

**STATEMENT OF BARBARA SOMSON, LEGISLATIVE DIRECTOR,
INTERNATIONAL UNION, UNITED AUTOMOBILE, AEROSPACE
& AGRICULTURAL IMPLEMENT WORKERS OF AMERICA
(UAW)**

Ms. SOMSON. Thank you very much, Senator Carper, and thank you to Senator Sanders, also, for inviting the UAW to share our views on the jobs impact of the Clean Air Act.

I speak from our experience representing workers in both the auto and heavy truck industries. What our experience shows is that EPA's regulation of greenhouse gas emissions from vehicles under the Clean Air Act is good for our industries and good for America jobs.

We view the regulation of mobile sources as a win-win that produces oil independence for our Nation, a cleaner, healthier environment for ourselves and our children, and an increased number of jobs in the auto sector. The simple equation for how this job creation works is that new technology required to meet the tailpipe emission standards represents additional net content on each vehicle, and bringing that additional content to market requires more engineers, more managers, more construction and production workers.

The UAW's membership is concentrated in the vehicle and vehicle component sector. The recent crisis in this sector has had a devastating impact on jobs. Six hundred and thirty-five thousand U.S. auto jobs have been lost since the year 2000, despite a rebound of 72,000 jobs since mid-2009.

To reverse this trend and to assure that cars of the future are made in the USA, the UAW and allies in the environmental and business communities began building support for Federal policies to increase fuel efficiency and reduce greenhouse gas emissions from the light-duty vehicle sector, and at the same time promote U.S. auto employment. Our work helped enact legislation that sup-

ports the domestic manufacturing of advanced technology vehicles and their key components.

Provisions in the Energy Independence and Security Act and the American Recovery and Reinvestment Act have encouraged and leveraged billions of private dollars into the domestic auto industry and have helped create tens of thousands of auto industry jobs here in the United States.

For example, nearly 40,000 jobs are, or will be, supported by the five loans made to date under section 136 of EISA. Included are jobs at Ford and Nissan facilities, and at the new innovative start-up that Senator Carper referred to, Fisker in Delaware, and also Tesla in California. More section 136 loans are expected this year, adding to the number of auto jobs.

The Recovery Act supported the establishment of 30 new electric vehicle battery and component manufacturing plants in the United States. The construction of these facilities has already put many construction workers back on the job and many thousands of permanent production jobs will be created when all of these plants reach full capacity.

The success of these job creation policies is depending in large measure on the regulation of tailpipe emissions under the Clean Air Act which provides regulatory and market certainty for manufacturers of advanced technology vehicles.

Absent continued Federal regulation by EPA and NHTSA, the UAW is concerned that we might repeat the troubled history that preceded the Obama administration's one National Program in 2009. Without such Federal regulations, we could experience another period of lawsuits, political warfare and public campaigns that would distract the industry's attention and divert it from the clear and certain path it is on now.

The UAW and the automakers strongly supported the National Program that runs from 2012 to 2016, and we are currently all working with EPA and NHTSA on the 2017–2025 standards. The UAW does not wish to see this work disrupted.

In conclusion, the 1 million active and retired members of the UAW are also citizens who are affected by the environment in which we live and raise our families. We are concerned about the effects of human-induced climate change for ourselves and future generations.

The benefits to human health and welfare flowing from the regulation of greenhouse gases under the Clean Air Act are substantial and they have positive economic effects. The UAW believes strongly that the regulation of tailpipe emissions under the Clean Air Act will help bring about these benefits while also creating jobs and helping to ensure a smooth and stable recovery for the auto industry.

I thank you for considering our views.

Senator Carper, I ask permission to substitute a corrected version of our written testimony, which we submitted by email, to the record.

Senator CARPER. Without objection.

Ms. SOMSON. Thank you.

[The prepared statement of Ms. Somson follows:]

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TESTIMONY OF

BARBARA SOMSON
LEGISLATIVE DIRECTOR

INTERNATIONAL UNION, UNITED AUTOMOBILE, AEROSPACE &
AGRICULTURAL IMPLEMENT WORKERS OF AMERICA (UAW)

on the subject of

CLEAN AIR ACT AND JOBS

before the

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY and the
SUBCOMMITTEE ON GREEN JOBS AND THE NEW ECONOMY

UNITED STATES SENATE

March 17, 2011

Good morning, Senators. My name is Barbara Somson and I am the Legislative Director of the UAW. I thank you for inviting the UAW to testify before these two subcommittees.

On behalf of the UAW's one million active and retired members, I am pleased to have this opportunity to share our views on the jobs impact of the Clean Air Act. I speak from our experience representing workers in both the auto and heavy truck industries. What our experience shows us is that the Environmental Protection Agency's regulation of greenhouse gas emissions from vehicles under the Clean Air Act is good for our industries and good for American jobs.

Based on our experience, the regulation of mobile sources has been a "win-win" that results in greater oil independence for our nation; a cleaner, healthier environment for ourselves and our children; and an increased number of jobs in the auto sector. The simple equation for understanding how this job creation occurs is that the new technology required to meet tailpipe emissions standards represents additional content on each vehicle, and bringing that additional content to market requires more engineers, more managers, and more construction and production workers.

Moreover, greater fuel efficiency allows consumers to spend less on fuel, which frees up that money to be spent on other goods and services, rather than flowing to the producers of oil for the U.S. market, the majority of which comes from foreign nations. So, in addition to creating jobs, these regulations are a key mechanism for protecting American families and their standard of living from the effects of rising and unstable oil prices. In other words, this is a bread and butter issue for American families.

The UAW's membership is heavily concentrated in the vehicle and vehicle component sector. The recent crisis in this sector had a devastating impact, with 635,000 U.S. auto jobs lost since the year 2000 despite a modest rebound of 72,000 jobs since mid-2009. Not surprisingly, the UAW has been very interested in developing and supporting policies to alleviate this crisis by promoting job creation. Especially important to us – since production workers are the bulk of the UAW's membership in the auto sector – are policies to promote domestic manufacturing.

In 2003 the UAW began building support for federal policies to increase fuel efficiency and reduce greenhouse gas emissions from the light-duty vehicle sector and at the same time promote domestic auto employment. This work was joined by labor, environmental, and business communities and it gained bipartisan support for several pieces of legislation that support the domestic manufacturing of advanced technology vehicles and their key components. These policies – embodied in the Energy Policy Act

of 2005, the Energy Independence and Security Act of 2007 (EISA), and the American Recovery and Reinvestment Act (ARRA) – have encouraged and leveraged billions of dollars in private investment in the domestic automobile industry and have established a proven track record of supporting the creation of tens of thousands of automobile industry jobs.

One year ago, the UAW released a report with the Natural Resources Defense Council and the Center for American Progress entitled “Driving Growth.” This report estimates that federal policies to save oil combined with federal manufacturing incentives could result in the creation of as many as 150,000 new automobile industry jobs for American workers by 2020. Evidence that this 2010 projection is accurate is found in two more recent Department of Energy reports. (Copies of each of these three reports are attached.)

A Department of Energy report on its loan programs, available on the Department’s website, shows that nearly 40,000 jobs are supported by the five loans made to date under the Section 136 Advanced Technology Vehicles Manufacturing Incentive Program authorized in EISA. More Section 136 loans – therefore more jobs – are expected this year. And a July 2010 report from the Department of Energy on ARRA grants to support advanced batteries and electric vehicles contains more impressive data. In 2009, the United States had only two factories manufacturing advanced vehicle batteries and produced less than two percent of the world’s advanced batteries. With matching grants under ARRA, we will have 30 plants operational by 2012, producing twenty percent of the world’s advanced batteries. By 2015, we are projected to produce forty percent.

The construction of these 30 facilities will employ thousands of construction workers, and tens of thousands more permanent production jobs will be created when all the plants are operational. Moreover, the economy of scale created by these new facilities is expected to significantly decrease the cost of advanced batteries, a savings that will be passed on to consumers of advanced technology vehicles.

A long list of firms have seen significant business opportunities flowing from the need to meet the EPA-NHTSA regulations, including all of the major automakers, union and nonunion; new innovative start-ups like Fisker in Delaware and Tesla in California; producers of completely new technologies such as Johnson Controls and A123; and many other firms such as Dow who are supplying the materials that go into advanced technology vehicles.

The success of these policies is dependent in large measure on the regulation of tailpipe emissions under the Clean Air Act which provides regulatory and market certainty for manufacturers of advanced-technology vehicles. In many ways the continuing recovery of the automobile industry in the United States has as its foundation the regulatory certainty of these tailpipe emission standards, which is driving innovation in every company and in every vehicle segment.

Absent continued federal regulation by both EPA and NHTSA, the UAW is concerned that we might repeat the troubled history that preceded the Obama administration's one National Program in 2009, which both the UAW and the auto industry strongly supported. We believe that without such federal regulation, we could experience another period of lawsuits, political warfare, and public campaigns that would distract the industry's attention and divert it from the clear and certain path it is on now.

The UAW and the automakers strongly supported the one National Program that will run from model year 2012 to model year 2016, and we are all currently working with EPA and NHTSA on the 2017-2025 standard. We do not wish to see this work disrupted.

In conclusion, the members of the UAW are also citizens who are deeply affected by the environment in which they live and raise their families. They are concerned about the effects of human-induced climate change for themselves and for future generations. The benefits to human health and welfare flowing from the regulation of greenhouse gasses under the Clean Air Act are substantial and have decided positive economic effects. The UAW believes strongly that the regulation of tailpipe emissions under the Clean Air Act will help bring about these benefits while also creating jobs in the automobile industry and helping to ensure a smooth and stable recovery for the industry.

Thank you for considering our views on these important matters, and I look forward to answering any questions you may have.

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Driving Growth: How Clean Cars and Climate Policy Can Create Jobs



*Report prepared for the Natural Resources Defense Council,
United Auto Workers and Center for American Progress*

by

Alan Baum, *The Planning Edge*
Daniel Luria, *Michigan Manufacturing Technology Center*



About NRDC

The Natural Resources Defense Council (NRDC) is a national nonprofit environmental organization with more than 1.3 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing. Visit us at www.nrdc.org.

About UAW

The UAW is one of the nation's largest unions with more than 390,000 active members and 600,000 retirees. Members are in over 750 local unions in the United States, Puerto Rico and Canada. Headquartered at Solidarity House in Detroit, the UAW is affiliated with the American Federation of Labor-Congress of Industrial Organizations (AFL-CIO), the International Metalworkers Federation (IMF) and the International Trade Union Confederation (ITUC). Chartered 75 years ago as the United Automobile Workers of America, the UAW has since become a union for all workers. While still representing skilled and production workers in the automotive and parts suppliers sectors, the UAW also represents workers in aerospace and defense, heavy trucks, farm and construction equipment, and other heavy and light manufacturing industries. The union's technical, office and professional sector represents workers in state and local government, universities, hospitals, casinos, media, technical and design centers, libraries, museums, zoos and legal services, as well as free-lance writers and in-home child-care providers. Visit us at www.uaw.org.

About CAP

The Center for American Progress is a nonpartisan research and educational institute dedicated to promoting a strong, just and free America that ensures opportunity for all. We believe that Americans are bound together by a common commitment to these values and we aspire to ensure that our national policies reflect these values. We work to find progressive and pragmatic solutions to significant domestic and international problems and develop policy proposals that foster a government that is "of the people, by the people, and for the people." Visit us at www.americanprogress.org.

Acknowledgments

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Preface

Reducing America's dependence on imported oil will not only enhance our national security, but it will create substantially more jobs than continuing on our current path of waste and unsustainable resource use. Reengineering the U.S. automobile fleet to use energy more efficiently will require new investments in advanced technology, increasing demand for skilled labor. Instead of presenting a threat to the auto industry, reigning in reliance on oil and cutting pollution from fossil fuels can demonstrably create jobs, accelerate innovation, and increase demand for advanced manufacturing.

Yet, while it is clear that increasing America's fuel economy can create more jobs, which nations will capture the economic benefits of this shift to a more fuel-efficient fleet, has yet to be determined. How Congress chooses to address comprehensive clean energy and climate legislation will strongly shape whether American workers enjoy the good jobs, competitive advantage, and sustained economic growth that will come with the move to a new clean energy economy.

This study offers two key insights on the nature of clean energy jobs in the automobile sector, each with profound implications for policy makers and the economy.

First, this paper documents that saving oil will create good jobs, not in the abstract, but directly by driving demand for specific additional manufactured components. The move to greater fuel economy means greater labor content per vehicle and higher employment across the fleet. This will include new investment in a host of incremental improvements to conventional gasoline powered internal combustion engines, from new controls for valves and timing, to variable speed transmissions and advanced electronics. It will also include entirely new systems like hybrid drive trains and advanced diesel engines.

Together these investments add up. By 2020 this analysis shows that, all things being equal, supplying the U.S. automobile market with more efficient cars could provide a net gain of over 190,000 new jobs from improvements to fuel economy alone.

The second finding is equally profound. While it is certain that the production of new technology will create demand for workers, *where* those jobs locate will be the product of policy choices. Of the over 190,000 jobs anticipated by 2020, the number of *domestic* jobs created could vary greatly. Fewer than 50,000 jobs might go to American workers, or, with different incentives, more than three times that number, as many as 150,000 U.S. workers, could find employment as a result of new investments in the engineering and production of the technology needed to improve fuel economy. It's up to us which path we take.

Many factors will shape where individual firms decide to produce fuel-efficient vehicles and their key components, and whether this new demand will be met through domestic sourcing or imports. But, it is clear that specific incentives can work to promote domestic production and drive new investment into existing plants and the skills of workers.

Strong comprehensive energy and climate legislation will ensure sustained reductions in oil use and carbon emissions. At the same time, it can capture economic growth through specific manufacturing conversion incentives funded through dedicated carbon allowance revenues. Legislation that sets a firm declining limit on global warming pollution is uniquely suited to this task for two reasons. First, it sends a critical message to markets and investors. Secondly, it provides a steady revenue source to drive long term, economic and environmental gains in the domestic auto sector and to assist in retooling assembly lines and retraining workers so that the United States continues to have a globally competitive auto industry that produces advanced clean vehicles. This integrated clean energy and jobs approach can expand opportunities for both U.S. firms and American workers, particularly in hard hit industrial states like Michigan, Indiana, and Ohio.

It is also worth noting that while the analysis undertaken in this paper shows substantial positive economic and jobs impacts from pursuing improved fuel economy, many additional benefits of energy independence do not even figure in this calculation. Therefore, as positive as this opportunity looks on paper, the real benefits go further.

Avoided fuel costs put real dollars back in the pockets of consumers, increasing consumption and economic benefits. At the same time, reducing demand for oil helps buffer price volatility, while decoupling the growth of the economy from rising energy imports reduces vulnerability to price spikes and supply disruptions. Further, by pursuing the high efficiency and low carbon emission technology path outlined in this report, U.S. auto makers will preserve access for American made cars to global markets, to serve the rapidly growing consumer demand for cleaner cars. As Americans use less oil to fuel our cars, we can also slow the flow of resources overseas to unstable and undemocratic nations, and invest instead in American jobs. By acting quickly, we can help to make the country less vulnerable to rising prices when global economic growth returns.

Clean energy manufacturing can drive the future prosperity of American workers if we creatively engage this opportunity. Our closest economic competitors in Asia and Europe are investing today in diversifying and expanding their manufacturing of clean energy technology. If the U.S. fails to make the same transition, we risk being left behind. However, climate legislation that includes manufacturing conversion incentives could help drive economic recovery and restore American leadership in the global automobile market and the global economy.

Which choice we make has yet to be determined. The future remains to be written.

— Bracken Hendricks
Senior Fellow
Center for American Progress

I. Economic Opportunity through Efficient Vehicles

The United States recently adopted standards to increase the fuel efficiency of the new vehicle fleet after more than two decades of inaction. The first measure, contained in the Energy Independence and Security Act of 2007, would have increased fleetwide fuel economy to at least 35 miles per gallon (mpg) by 2020. This standard was strengthened in May 2009 through a new program that established national harmonized fuel economy and greenhouse gas tailpipe standards. Under the latter program, the new passenger vehicle fleet will achieve, on average, 250 grams of CO₂ equivalent per mile by 2016. This is roughly equal to 35.5 mpg, requiring new vehicle fleet average fuel consumption to fall by 30 percent from 2012 to 2016.

Compliance with the regulations now adopted by the federal government will require a substantial deployment of new technology. The new technology represents additional content on each vehicle; content that will require more engineers and more workers to produce. This document identifies existing technologies that will enable automakers to meet the new standards, and uses illustrative combinations of technologies to make estimates of the *potential* for job creation in the auto industry and the industries that supply it.

While the media often equate fuel-efficiency gains with hybrids, wider adoption of more mundane clean-technology packages, many of which are already in use, will be critical. For instance, efficient gasoline engines and transmissions provide excellent fuel economy benefits at modest cost. Similarly, higher fleet fuel economy in Europe and Japan make it clear that clean diesel can play a large role.

To evaluate the opportunities to improve fuel efficiency and create clean energy auto sector jobs, the Natural Resources Defense Council (NRDC), the United Auto Workers (UAW), and Center for American Progress (CAP) commissioned The Planning Edge (TPE) and the Michigan Manufacturing Technology Center (MMTC) to model the 2014 U.S. new car and light truck market, considering North American-assembled vehicles, engines, and transmissions.

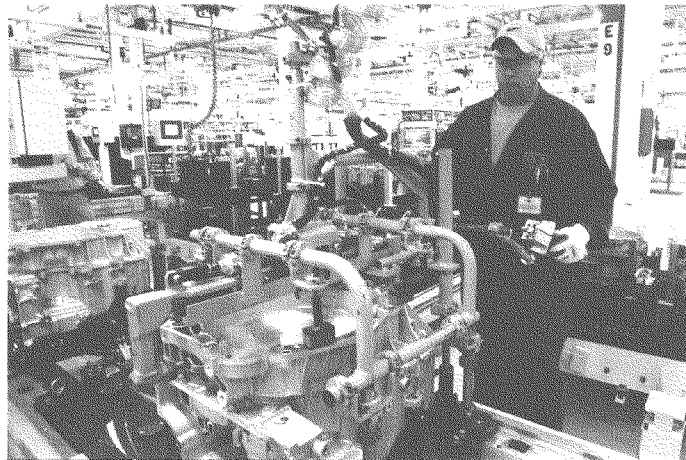
The production forecasts are based on a 2014 market size (U.S. sales) of 15.7 million, substantially higher than the current sub-10-million level, though well below the 1998–2006 average of 16.7 million. This analysis forecasts that 13.3 million cars and light trucks will be assembled in North America in both 2014 and 2020. Nine million of those will be produced in the United States. These levels of domestic and North American vehicle production are comparable to those of model year 2008. This similarity allows a straightforward comparison of auto sector jobs with and without the contributions of advanced vehicle technologies. The results suggest that clean vehicles can provide substantial employment benefits. The question left unanswered is where those jobs will be located—off shore or in the U.S.?

Our analysis conservatively assumes that gasoline and diesel prices will remain at today's level, in real terms. Thus, the mix of sales across traditional segments, i.e., small and large cars, and the various classes of light trucks, is held constant. By holding these factors constant we can ask the question: Other things equal, what *existing fuel-saving technologies can be applied widely enough in the same-mix new vehicle fleet to meet the model year (MY) 2016 standard and to sustain a 4 percent annual improvement through MY 2020?*

In this report, TPE and MMTC evaluate the likely contribution of the commercially available technologies that firms will use to meet the 2016 standard and to make annual improvements beyond 2016. Toward this end, the report examines two benchmark years. First, it assesses clean technology deployment for MY 2014. This year is chosen because TPE's near-term forecast includes supplier information and automotive business forecasts extending through that time. Second, the report examines technology deployment for 2020. The 2020 technology forecast assumes that manufacturers make annual 4 percent improvements beyond their 2016 performance targets. Taken as a whole, this time frame represents the steady adoption of clean technology as manufacturers work toward, meet, and eventually exceed the existing targets.

Finally, the report assesses the economic benefits, focusing on job creation, associated with growing demand for fuel-saving technologies. Several findings are shown below:

- ❖ By 2014, the light-duty vehicle fleet modeled in this study would achieve 31.5 mpg. This will add about \$848 to the manufacturing cost of each car and light truck assembled in North America. If this cost is applied across 13.3 million North American assemblies, \$11.3 billion more in content will be added to North American-built vehicles.
- ❖ This will create 62,000 additional jobs, of which 20,000–54,000 will be in the United States. Just under 40 percent of these jobs will be in the auto and auto parts sector. The remaining 60 percent will be either in the broader manufacturing supply chain, including raw materials such as steel or intermediate goods (stamped, machined, molded, cast and forged parts), or in nonmanufacturing jobs elsewhere in the economy. Recaptured energy expenditures could provide further economic benefits, though those effects have not been modeled in this study.
- ❖ Achieving 40.2 mpg by MY 2020 would add an additional \$1,152 to the manufacturing cost of each vehicle, for a total increase of \$2,000 over 2008. The added production of \$15.4 billion in vehicle content (a total of \$26.6 billion over 2008) across North American assemblies will produce 191,000 jobs beyond 2008, of which 49,000–151,000 will be in the United States. Roughly 40 percent of the domestic jobs will be in the auto sector, while the balance will be in other industries such as services and the broader manufacturing supply chain.
- ❖ The wide variation in jobs created is due to the unknown potential for the United States to capture the production of these advanced vehicle technologies. The short record so far indicates that policies supporting the domestic manufacture of advanced technology vehicles can be successful. (For greater detail, refer to the section on Lithium Ion Takes Off in the United States.)



A UAW Local 909 worker assembles transmissions at the General Motors Powertrain plant in Warren, Michigan.

REBECCA COOK

Lithium Ion Takes Off in the United States

Lithium-ion batteries are a key enabling technology in the advancement of hybrid vehicles and are necessary for the market introduction of plug-in hybrids and electric vehicles. This technology was largely developed in the United States, but production is currently dominated by Asian-Pacific nations, especially Japan, China, and Korea. A 2006 study by the National Institute for Standards and Technology (NIST) makes clear that these nations use public policy to encourage the development of the industry, and especially the production of the battery cells themselves.¹

These nations realize that if vehicle electrification emerges as the wave of the future, advanced battery production will be a core competency that allows them to maintain or develop from scratch a domestic automobile industry. Were the United States to fail that test, the long-term economic and security consequences could be harsh.

In 2007, the Energy Independence and Security Act established incentives for the domestic manufacturer of advanced batteries. The American Recovery and Reinvestment Act of 2009 subsequently funded these incentives. Earlier this year, the federal government announced the first wave of awards under these programs. The results are spectacular—48 projects have been announced to develop and deploy batteries and electric vehicle components in the United States.²

The bottom line is that the United States could emerge as a leading producer of lithium-ion batteries in less than five years because of government policies that lower the cost and risk of critical technology development. That is smart policy for jobs, energy security and carbon avoidance, and shows what well-structured government stimulus policies can achieve.

II. Methodology

This report illustrates the potentially large economic benefits of advanced-technology vehicle deployment under the right set of conditions: policies that encourage better fuel economy and domestic manufacturing. The sizable benefits underscore the federal government's critical role in introducing new technology through an appropriate policy combination of regulation and incentives for manufacturers. Such a combination will result in clean and efficient vehicles that are produced domestically. Toward the end of the report, we examine different degrees of economic benefit linked to the level of domestic manufacturing activity.

In the scenarios modeled here, MY 2014 vehicles will achieve an average (new definition—see note 3) CAFE rating of 31.5 mpg, as compared to 27 mpg in 2008. As previously mentioned, this will require an additional \$848 per vehicle. If fuel economy reaches approximately 40.2 mpg in MY 2020, an additional \$1,152 per unit will be required. This fuel economy estimate is chosen for simplicity and reflects a 4 percent annual performance improvement over the MY 2016 standard. It is roughly a continuation of the 2012–2016 fuel economy trajectory already in progress.

A determined federal initiative could push fuel economy beyond levels contemplated in this study. The Union of Concerned Scientists estimates that fleet average fuel economy could reach 42 mpg by 2020 if hybrid sales, already undergoing rapid adoption, reach 25 percent of the new vehicle market (rather than the 11 percent in our projection).³ Federal policies that are successful in sufficiently lowering the cost of plug-in hybrids would enable even higher fuel economy. However, such programs are beyond the scope of this report. The analysis therefore makes the fuel economy assumptions listed in the table below.

Table 1. Forecast of Domestic and North American Vehicle Production

Metric	Model Year 2008	Model Year 2014	Model Year 2020
U.S. Car & Light Truck Production	9.7 million	9.3 million	9.3 million
North American Car & Light Truck Production	14 million ⁴	13.3 million	13.3 million
Car mpg (new definition) ⁵	31.5	36.5	44.1
Truck mpg (new definition)	22.2	24.8	34.1
Overall mpg (new definition)	26.7	31.5	40.2

Fuel economy improvements will utilize a broad range of technologies and benefit a diverse set of workers and businesses. TPE considered the expansion or first application of 15 technologies and components as changes and additions from current practice:

Hybrid and diesel vehicles:

- ※ Switching from six- and some four-cylinder gasoline engines to four-cylinder diesel engines ("4D"). All 2014 and 2020 diesels are assumed to include after-treatment systems.
- ※ Switching from eight- and some six-cylinder gasoline engines to six-cylinder diesel engines ("6D")
- ※ Switching from eight-cylinder gasoline engines to eight-cylinder diesel engines ("8D")
- ※ Switching from conventional gasoline-engine-only vehicles to full gas-electric or plug-in hybrids, in which an electric motor, new controls, regenerative braking, and a lithium-ion battery pack are added and a power-split device replaces the conventional transmission ("full hybrid")
- ※ Switching from conventional gasoline-engine-only vehicles to so-called mild hybrids, with added power controls, an integrated starter-generator, and (particularly for Honda) additional features ("mild hybrid")

Four technologies that can be applied to gasoline and diesel engines, often at the same time:

- ⊗ Direct injection, for both gasoline (“GDI”) and diesel (“DDI”) engines, in which traditional fuel injection is replaced by a more efficient system that improves the combustion of fuel. GDI and DDI are often referred to as “common rail.”
- ⊗ Turbocharging (“turbo”), in which additional power is generated from smaller-displacement engines, permitting them to replace larger-displacement engines
- ⊗ Variable valve lift (VVL) and timing (VVT), in which new mechanical and electronic controls optimize the position of engine valves for a variety of driving situations
- ⊗ Cylinder deactivation (“CD”), in which up to half of an engine’s cylinders are shut down when power requirements drop (e.g., flat and downhill highway driving)

Three modified automatic transmissions:

- ⊗ Switching from four- and five- to six-speed automatic transmissions (“A6”)
- ⊗ Switching from four- and five-speed to continuously variable transmissions (“CVT”) in nonhybrids
- ⊗ Switching from four- and five-speed to dual-clutch transmissions (“DCT”)

Three features compatible with most vehicles (e.g., full hybrids already have Start-Stop):

- ⊗ Switching to high-efficiency alternators (“HEA”) in order to generate high levels of power at low speeds, thereby reducing the load on the engine and reducing the loss of energy
- ⊗ Adding “Start-Stop,” in which the gasoline or diesel engine turns off during extended stops (long red lights, traffic jams)
- ⊗ Adding electric power steering (“EPS”), which is more compact than the traditional mechanical system and draws electric power from the engine only as needed

The table below shows the forecasted North American technology application rates (in thousands of vehicles). As modeled here, fuel economy of 40.2 mpg for 2020 requires that two technologies—high-efficiency alternators and electric power steering—not in use in 2008 become nearly universal, and that dual-clutch transmissions be applied to 30 percent of the U.S.-produced new vehicle fleet. The rest of the technologies are already in use, and nearly all will have at least 10 percent penetration by 2014.

Regarding V8 diesels, the technology application rates shown below only include vehicles weighing less than 8,500 pounds. Although heavier diesel vehicles are not addressed in this report, their engines are important because the U.S. facilities that produce them are prime locations for new six-cylinder diesels as well. Smaller diesel engines will share components with larger diesels, allowing these plants production efficiencies at lower volumes.

Application rates were achieved by examining every vehicle-engine-transmission combination and deciding which technologies, if any, to apply to each. Those decisions were informed by production logic, e.g., whether it would make sense to apply a technology to a very small number of engines. They were also based upon the particular manufacturers’ strengths and their near- and midterm production plans. Thus, for example:

- ⊗ The report assumes higher application rates of three technologies to engines with Ford’s EcoBoost design, which combines GDI and turbo and soon will be matched primarily to dual-clutch transmissions.
- ⊗ The report assumes faster dieselization of Chrysler vehicles because of Chrysler’s connections to Fiat in North America and Europe. Similarly, it assumes faster dieselization of Honda vehicles, given their advanced designs in this area.

This report also favors applying technology to engines that have, or are slated to have, complementary features, e.g., adding GDI to engine families with VVL/VVT. Conversely, it is least likely to apply more expensive technologies to vehicle-engine-transmission combinations in the lowest-price vehicle tiers. Buyers of these vehicles are assumed to be the most price sensitive. Production volumes below reflect the number of vehicles assembled in North America that use each of the technologies. These advanced technology components could be produced inside or outside the United States. Production figures, reported in thousands, are for model years (typically October through September).

Table 2. Application of Technology in Thousands of Vehicles

Technology	2008 Actual	2014	2020	% of 2020 Assemblies	Change, 2008-2020
D4	69	339	709	5.34%	640
D6	144	297	329	2.48%	185
D8	130	509	534	4.02%	404
All Diesels	343	1145	1572	11.84%	1229
Full hybrid	85	665	1442	10.86%	1357
Mild hybrid	5	52	51	0.38%	46
GDI/DDI	668	1807	3577	26.94%	2909
Turbo	247	1132	2556	19.25%	2309
VVL/VVT	2139	4125	9426	70.98%	7287
CD	1126	1032	1003	7.55%	(123)
A6	1926	5944	5708	42.99%	3782
CVT, excluding hybrids	747	960	1201	9.05%	454
DCT	0	388	4173	31.43%	4173
HEA	0	8615	10460	78.78%	10460
Start-Stop, excluding hybrids	0	0	11633	87.61%	11633
EPS	41	1170	11428	86.07%	11387

TPE evaluated unit technology costs by averaging data from as many as four sources.⁶ These estimates inform what might be called the "minimum efficient volume." From previous work, TPE defines this as roughly 400,000 units for components and 200,000 for complex assemblies such as diesel engines and hybrids.⁷ Based on widely used engineering cost studies, this study estimates that unit cost would be substantially higher at lower volumes and up to 17 percent lower at higher volumes. The table below expresses the assumed cost-volume relationship. A technology with a unit cost of \$500 at 400,000 units has a unit cost of about \$700 at 100,000 units and about \$415 at 2 million units. There are two exceptions to the rule that production volumes under 400,000 units incur cost penalties: for diesels and full hybrids, 200,000 units constitute an economic module. Unlike many of the discrete fuel-saving technologies, diesel engines and hybrids are more complex, multicomponent assemblies. For components, this analysis uses the following table to adjust unit cost for deviation in application volumes from the 400,000 *numeraire*.

Table 3. Deviation Cost Adjustments

Forecasted Volume	Percent of Numeraire	Example: \$500 Technology
Less than 100,000	150	\$750
100,000 – 249,999	130	\$650
250,000 – 399,999	110	\$550
400,000 – 499,999	100	\$500
500,000 – 999,999	96	\$480
1,000,000 – 1,999,999	89	\$445
2,000,000 or more	83	\$415

Unfortunately, one cannot determine technology costs by total production. For example, turbochargers are estimated to reach 1,132,000 units in 2014. However, this does not produce a unit cost of 90 percent of its *numeraire* value of \$450. This is because not all of the forecasted 1,132,000 turbochargers will be built by one supplier in one facility. Since there is no precise way to determine how the volume will be divided, TPE divided production volumes more or less equally among three suppliers.⁸ Thus the 1,132,000 turbos are really three packets of 377,000, so their unit cost is estimated at 110 percent of the \$450 *numeraire*, or \$495. The table below depicts the unit technology costs used in this study.

Table 4. Unit Cost and Fuel Saving Estimates

Technology	Gross Unit Cost at 400,000 Units	Content Displaced	Cost Displaced	Net Unit Cost at 400,000 Units	Illustrative Fuel Savings
D4	\$3,400	Gas engine	\$1,000	\$2,400	25.0%
D6	\$4,375	Gas engine	\$1,200	\$3,175	22.0%
D8	\$5,700	Gas engine	\$1,500	\$4,200	20.0%
Full hybrid	\$4,600	Various	\$1,100	\$3,500	45.0%
Mild hybrid	\$1,500	Various	\$500	\$1,000	20.0%
GOV/DBI	\$900	Conventional	\$325	\$575	16.8%
Turbo	\$450			\$450	8.4%
VVL/VVT	\$305			\$305	9.8%
CD	\$193			\$193	8.4%
A6	\$1,020	A3, A4, A5	\$900	\$120	7.7%
CVT, excluding hybrids	\$1,150	A3, A4, A5	\$900	\$250	8.4%
DCT	\$1,400	A3, A4, A5, A6, CVT	\$900	\$500	13.0%
HEA	\$140	Conventional	\$35	\$105	2.1%
Start-Stop, excluding hybrids	\$600			\$600	10.8%
EPS	\$160			\$160	2.8%

Data averaged from EPA (2008), MARTEC (2008), Meszler (2008) and Hammett (2004).

After determining technology application rates and the net unit costs, TPE and MMTTC calculated the total cost of the added technologies across the 2014 and 2020 fleets. These figures, which reflect additional vehicle content, produce a substantial number of jobs. The costs are more than offset by avoided petroleum expenditures.

Economic estimates used in this report rely heavily on TPE's previous research.⁹ Custom runs by Regional Economic Models, Inc. (REMI) were used to delve into the employment implications of domestic hybrids and advanced diesel production. Using the latest technical coefficient and intra-U.S. trade flow data then available, REMI associated each "packer" of 100,000 traditional U.S.-made vehicles with 21,270 U.S. jobs. REMI's estimates have proven highly accurate in the past.¹⁰ The analysis then makes several downward adjustments to reflect declining labor intensity during subsequent years. First, it slightly reduces jobs per 100,000 vehicles to 20,175, accounting for manufacturing efficiency gains.¹¹ While production efficiency could be expected to cause larger reductions, those losses have been offset by increases in average vehicle content (e.g., airbags, navigation systems, etc.). Similarly, clean vehicle technologies illustrate an environmentally favorable way to balance productivity improvements with robust auto sector employment. However, as shown later, federal policy will play an important role in ensuring that both jobs and the manufacture of vehicle content are located in the United States.

Finally, TPE made a second conservative downward adjustment to reflect the recent shift toward transplant facilities. It is possible that these facilities will use lower North American content than their "Detroit Three" counterparts. To that extent, the U.S. jobs-per-100,000 figure was reduced a further 16 percent to about 17,000 for 2014 and 2020. Even under these assumptions, clean technologies deliver significantly more jobs than vehicles without the same features.

This conclusion is reached by applying labor intensities to the component cost analysis outlined above. For 2008, J.D. Power & Associates report a median new car and light truck pretax transaction price of \$25,594. Based on prior analysis, TPE and MMTTC estimate that 20 percent of this amount is attributable to brand marketing, transportation, dealer markup, warranty repair, interest, and other costs that apply to full vehicles but not to their components. The cost to design, manufacture, and test each vehicle averages about \$20,000, which is a critical number to the analysis. TPE and MMTTC assume that employment is proportional to cost. Thus, a fuel-saving technology that adds \$500 to the cost of each vehicle is associated with 2.5 percent of the \$20,000 vehicle cost. It is therefore associated with 2.5 percent of the 17,000 jobs per 100,000 units. If the technology is applied to 1 million vehicles, it would create 4,250 U.S. jobs.

III. Job Potential and Policy Implications

The methodology discussed above shows that efficient vehicle technologies will produce significant net employment benefits. The table below illustrates the jobs associated with TPE's 2014 and 2020 technology application rates. For 2014 and 2020, unit costs have been adjusted depending on the application rate of the new technology and total volume divided among three suppliers. For 2008, it is assumed that all technologies were produced at *numeraire* volumes, many of them outside of North America. Not all of the numbers in the chart below are U.S., or even North American jobs. They are total jobs, *anywhere in the world*, associated with the forecasted technology application on vehicles assembled in North America.

Table 5. Total Jobs Associated with Clean Vehicle Technologies

Technology	Net unit cost at forecasted volume	2008 Jobs	2014 Jobs	2020 Jobs
D4	\$2,400	1761	6916	14464
D6	\$3,175	4862	8015	8879
D8	\$4,200	5807	18171	19062
Diesels		12430	33102	42405
Full hybrid	\$3,500	3014	19784	42900
Mild hybrid	\$1,000	46	443	434
GDI/DDI	\$552 (2014), \$518 (2020)	4085	8479	15750
Turbo	\$495 (2014), \$432 (2020)	1182	4763	9386
VVL/VVT	\$275 (2014), \$253 (2020)	6938	9642	20271
CD	\$212	2311	1860	1807
A6	\$107	2458	5406	5192
CVT, excluding hybrids	\$275 (2014), \$250 (2020)	1986	2244	2552
DCT	\$850 (2014), \$445 (2020)	0	2144	14720
HEA	\$87	0	6297	7736
Start-Stop, excluding hybrids	N/A (2014), \$498 (2020)	0	0	49242
EPS	\$176 (2014), \$133 (2020)	70	2380	12919
All		34520	96544	225314
Change from 2008			62024	190794

Potential for New Jobs to be Created at U.S. Facilities

Clearly, enhancing the value of cars and light trucks with fuel-saving technologies will result in a large number of additional jobs—62,000 more between 2008 and 2014 and another 128,000 in the subsequent six years. ***But there is no guarantee that the United States will capture all, or even most of these jobs.*** Both Europe and Japan have substantial leads in hybrids, diesels, DDI, and turbochargers. Most of these technologies have high value-to-weight ratios, making them eminently shippable. Nearly all of the key components in Nissan, Honda, Toyota, Ford, and Mercury hybrids sold in the United States are made in Japan.

Even if the major suppliers of these technologies conclude that future volumes justify North American manufacturing, it does not guarantee that such production will occur in the United States. In Europe, when the market for DDI/common rail for diesels spiked, Bosch built a huge new facility in low-wage Romania from which it supplies more than 80 percent of Europe's demand. The same could happen in North America, with Mexico in the role of Romania.

But there are also reasons why the technology needed to meet higher fuel economy standards could be produced in the United States. Most of North America's high-volume engine and transmission plants are located domestically rather than in Canada or Mexico. The same is true for nearly all advanced vehicle R&D and testing capacity. Many of these technologies "bolt on" to engines, most of which are assembled domestically. While Europe and Japan have a lead in some of them, their focus is on their application in small cars, which do not dominate the U.S. sales or production mix.

Thus, it is critical that federal government play a leading role in capturing for the United States the production of these technologies and the attendant economic output and employment. Comprehensive clean energy and climate legislation is the ideal policy tool because it provides support at the scale, predictability and duration needed to fund a meaningful economic and technological transition. Domestic manufacturing incentives funded through steady allowance revenues, could prove crucial in the choices firms make about where to locate production and our economic stake in these emerging trends. The range of possibilities is set out under three scenarios for U.S. production of fuel-saving technologies:

1. **Low:** U.S. facilities produce only 25 percent of the total technology value and receive 25 percent of the job benefits
2. **Mid:** U.S. facilities produce 50 percent of the total technology value and receive 50 percent of the job benefits
3. **High:** U.S. facilities produce 75 percent of the total technology value and receive 75 percent of the job benefits

There are, of course, exceptions to this rule:

- ⊛ VVL/VVT, CD, and A6 are already substantially produced domestically, and there is no reason to think that the U.S. share of their production will decline.
- ⊛ Except for some six-cylinders diesels in Mercedes and BMW models, six- and eight-cylinder diesels are unique to the North American market. This study assumes that 75 percent of these engines will be made in the United States, rather than in Mexico or Canada.
- ⊛ Four-cylinder diesels may not be made in the United States until volumes grow more than TPE predicts they will through about 2016. But there is a good possibility that they will be made in at least some gasoline and (larger) diesel engine plants.

The table below shows the resulting forecast for U.S. jobs. As discussed above, it outlines the low, mid, and high scenarios that could result from different levels of federal commitment.

Table 6. U.S. Jobs Associated with Clean Vehicle Technologies

Technology	Estimated 2008 U.S. Jobs	2014 U.S. Jobs			U.S. 2020 Jobs		
		Low	Mid	High	Low	Mid	High
D4	0	0	3458	5187	0	7232	10848
D6	3174	6011	6011	6011	6659	6659	6659
D8	5807	13627	13627	13627	14297	14297	14297
Diesels	8981	19638	23096	24925	20856	28188	31804
Full hybrid	301	4946	9892	14838	10725	21450	32175
Mild hybrid	46	111	222	333	108	217	325
GDI/DDI	817	2125	4249	6374	3937	7875	11812
Turbo	473	1159	2318	3477	2346	4692	7038
VVL/VVT	3469	3469	4821	7231	5063	10135	15198
CD	2311	1860	1860	1860	1807	1807	1807
A6	2458	2458	2703	4054	1298	2596	3894
CVT, excluding hybrids	0	0	1122	1683	638	1276	1914
DCT	0	536	1072	1608	3680	7360	11040
HEA	0	1574	3149	4723	1934	3868	5802
Start-Stop, excluding hybrids	0	0	0	0	12310	24621	36931
EPS	0	595	1190	1785	3230	6460	9690
All Domestic Jobs	18856	38471	55694	72791	68032	120545	169430
Change from 2008		19615	36838	53935	49176	101689	150574
Domestic Jobs as a Percent of Total Jobs	59.1%	39.8%	57.7%	75.4%	30.2%	53.5%	75.2%

IV. Conclusion

Clearly, the development and production of clean energy technologies in the light-duty vehicle sector represents an enormous opportunity to maintain and create domestic employment. But the size and ultimate realization of that opportunity depends partly on the decisions of U.S. policymakers. Contingent on fuel economy rules, currency exchange rates, incentives for U.S. production (or the lack thereof), and automakers' and technology suppliers' production location decisions, the United States could gain fewer than 20,000 jobs from 2008 to 2014, or nearly 54,000. By 2020, the U.S. job gain relative to 2008 could be as little as 49,000 or more than 150,000. These figures also include jobs in the broader manufacturing supply chain, including raw materials and intermediate goods, as well as nonmanufacturing jobs created elsewhere in the economy.

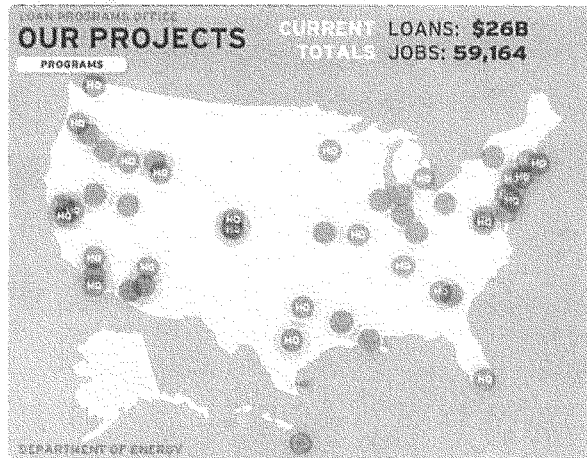
Many of these jobs—especially those in diesels and in transmissions—could be expected to be concentrated in the three-state Michigan-Indiana-Ohio region. This region was home to 55 percent of engine and 85 percent of North American transmission production in 2008. Based on each state's 2008 employment shares, Michigan could expect to receive 21 percent of all jobs created by auto sector investment. Indiana could receive 5 percent, and Ohio could receive 7 percent. Applying these estimates to the findings above suggests that Michigan could gain as many as 32,000 jobs as a result of clean technology adoption (compared to 2008). Indiana could gain nearly 8,000, and Ohio could gain nearly 11,000 jobs. The remaining jobs would likely be much more broadly distributed across the United States. Locations of existing Delphi, Bosch, Denso, Aisin, Borg Warner, Siemens, GKN, and ZF facilities may be a useful, if incomplete, guide to the likely spatial distribution of fuel-saving technology production in the United States and the rest of North America.

Endnotes:

- 1 Ralph J. Brood, *Factors Affecting U.S. Production Decisions: Why Are There No Volume Lithium-Ion Battery Manufacturers in the United States*, National Institute of Standards and Technology, December 2006.
- 2 U.S. Department of Energy, "President Obama Announces \$2.4 Billion in Grants to Accelerate the Manufacturing and Deployment of the Next Generation of U.S. Batteries and Electric Vehicles," <http://www.energy.gov/news2009/7749.htm> (November 24, 2009).
- 3 Jim Kliesch, *Setting the Standard: How Cost-Effective Technology Can Increase Vehicle Fuel Economy*, Union of Concerned Scientists, 2008.
- 4 The sales decline in calendar year 2008 resulted in large inventories and a huge drop in production in model year 2009. A more stable market assumed in 2014 and 2020 results in a more "normal" result where U.S. sales exceed North American production by a significant amount because of imports.
- 5 The new definition of cars and trucks go into effect in model year 2012. This requires that what would have been previously classified as trucks, namely two-wheel drive utilities under 6,000 pounds gross vehicle weight, be considered cars for fuel economy purposes.
- 6 EPA, *EPA Staff Technical Report: Cost and Effectiveness Estimates of Technologies Used to Reduce Light-duty Vehicle Carbon Dioxide Emissions*, March 2008; MARTEC, *Variable Costs of Fuel Economy Technologies*, study prepared for The Alliance of Automobile Manufacturers, as amended December 12, 2008; Dan Meszler, Meszler Engineering Services (MES), unpublished report, fall 2008; Patrick Hammett et al., *Fuel-Saving Technologies and Facility Conversion: Costs, Benefits, and Incentives*, study prepared for the National Commission on Energy Policy and Michigan Environmental Council, November 2004.
- 7 Hammett et al., 2004.
- 8 This assumption, while apparently arbitrary, is surprisingly robust. In component system after component system, the rule that three competitors share the vast majority of the market seems to hold. In North America, Bosch, Delphi, and Siemens split many powertrain components. Delphi, Denso, and Visteon divide much of the HVAC market, though they must share some components with Valeo. Aisin, ZF, and American Axle divide the market for many axle and drivetrain components. Borg Warner, GKN, and Magna compete in many chassis and powertrain areas. Magna, Oghara, and Budd dominate outsourced frames, subframes, and body panels. In Europe and Japan, such Tier 1 triads are also common.
- 9 Hammett et al., 2004
- 10 At that time, about 45 percent of these jobs were in auto and auto parts, and the other 55 percent in other sectors. Thus, in a year such as 2005 in which 11.5 million light-duty vehicles were assembled in the United States, REMI would have forecasted 2,446,000 U.S. jobs, including about 1,100,000 in auto and auto parts, almost exactly the figure (1,096,700) reported by the Bureau of Labor Statistics.
- 11 By 2008, the Bureau of Labor Statistics estimate for U.S. motor vehicle and parts jobs had declined to 877,000. The REMI method would have therefore estimated 1,950,000 total U.S. jobs of which 45 percent would have been in the auto sector (this number is now closer to 40 percent). Dividing by 21,270 U.S. jobs per 100,000 vehicles would have predicted production of 9,170,000 units; in fact, 9,666,000 were produced. Thus the 21,270-per-100,000 ratio had declined modestly to about 20,175.



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The Financing Force Behind America's Clean Energy Economy

The Department of Energy's Loan Programs enable DOE to work with private companies and lenders to mitigate the financing risks associated with clean energy projects, thereby encouraging their development on a broader and much-needed scale. LPO is one of the largest and most productive energy project finance operations in the world and has committed over \$26 billion to support 25 clean energy projects. These projects create or save almost 59,000 jobs across 20 states.

LPO has issued conditional commitments to eight power generation projects with cumulative project costs of over \$21 billion. This represents a greater investment in clean energy generation projects than the entire private sector made in 2009 (\$10.6 billion), and almost as much as was invested in such projects in 2008 - the peak financing year to date (\$22.6 billion).

In the last 12 months, LPO closed or offered 15 loans or loan guarantees totaling nearly 17 billion (over \$26 billion in total project costs), including:

- Diamond Green Diesel, a biodiesel project that will nearly triple the amount of renewable diesel produced domestically;
- Abengoa Solar Inc. and BrightSource Energy, Inc., two of the world's largest solar thermal projects;
- Georgia Power Company's Vogtle project, a 2,200 megawatt (MW) nuclear power plant - the nation's first in the last three decades;
- Caithness Shepherds Flat, the world's largest wind farm with generating capacity of 845 MW; and
- Vehicle Production Group, the first wheelchair-accessible vehicle that will run on compressed natural gas.

To learn more, click and explore our Project Map above.

Program	Loan Guarantee Amount	Jobs (permanent/ construction)	Date of agreement	Locations	Status
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Georgia Power Company	\$8.33 billion	800/3,500	Feb 2010	Atlanta, GA Tucker, GA Waynesboro, GA	Conditional Commitment
AREVA	\$2 billion	310/1,000	May 2010	Idaho Falls, ID	Conditional Commitment
Red River Environmental Products, LLC	\$245 million	70/500	Dec 2009	Littleton, CO Coushatta, LA	Conditional Commitment
SAGE Electrochromics, Inc.	\$72 million	160/210	Mar 2010	Fairbault, MN	Conditional Commitment

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Abengoa Solar, Inc.	\$1.45 billion	80/1,600	July 2010	Gila Bend, AZ	Closed
Abund Solar	\$400 million	1,500/2,000	July 2010	Longmont, CO Tipton, IN	Closed
AES Corporation	\$17 million	5/30	July 2010	Johnson City, NY	Closed
Beacon Power Corporation	\$43 million	14/20	Aug 2010	Tyngsboro, MA Stephentown, NY	Closed
BrightSource Energy, Inc.	\$1.4 billion	86/1,000	Feb 2010	Oakland, CA Baker, CA	Conditional Commitment
Nevada Geothermal Power Company, Inc.	\$78.8 million	14/200	Sept 2010	Humbolt County, NV	Closed
Kahuku Wind Power, LLC.	\$117 million	10/200	July 2010	Boston, MA Kahuku, Oahu, HI	Closed
Nordic Windpower USA, Inc.	\$16 million	757	July 2009	Berkeley, CA Pocatello, ID	Conditional Commitment
Solyndra Inc.	\$535 million	1,000/3,000	Sept 2009	Fremont, CA	Closed
US Geothermal, Inc.	\$102.2 million	10/150	June 2010	Boise, ID Malheur County, OR	Conditional Commitment
Caithness Shepherds Flat	\$1.3 billion	35/400	Oct 2010	Gilliam and Morrow Counties, OR	Closed
LS Power (ON Line)	\$350 million	15/400	Oct 2010	Ely to Las Vegas, NV	Conditional Commitment
Agua Caliente	\$967,000,000	10/400	Jan 2011	Yuma County, AZ	Conditional Commitment
Diamond Green Diesel	\$241,000,000	63/700	Jan 2011	Norco, LA	Conditional Commitment
SoloPower	\$197,000,000	500/270	Feb 2011	Wilsonville, OR	Conditional commitment
Record Hill Wind	\$102 Million	7200	Mar 2011	Roxbury, ME	Conditional Commitment

Program	Loan Amount	Jobs (created/saved)	Date of agreement	Number of Projects
Ford Motor Company	\$5.9 billion	33,000	Sept 2009	13
Fisker Automotive	\$529 million	2,000	Apr 2010	2

http://ipo.energy.gov/?page_id=45

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Nissan North America, Inc.	\$1.4 billion	1,300	Jan 2010	2
Tesla Motors	\$465 million	1,500	Jan 2010	2
The Vehicle Production Group LLC	\$50 Million	900	Nov 2010	1

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DEPARTMENT OF ENERGY

THE RECOVERY ACT:

TRANSFORMING AMERICA'S TRANSPORTATION SECTOR

BATTERIES AND ELECTRIC VEHICLES

WEDNESDAY, JULY 14, 2010

Embargoed until 8:00 PM EDT



The Recovery Act: Transforming America's Transportation Sector

Batteries and Electric Vehicles

The Obama Administration is investing in a broad portfolio of advanced vehicle technologies. These investments—investments in American ingenuity, innovation, and manufacturing—are driving down the costs associated with electric vehicles and expanding the domestic market. Investments in batteries alone, for example, should help **lower the cost of some electric car batteries by nearly 70 percent before the end of 2015**. What's more, thanks in part to these investments, **U.S. factories will be able to produce batteries and components to support up to 500,000 electric-drive vehicles annually by 2015**. Overall, **these investments will create tens of thousands of American jobs**.

As part of the Department of Energy's \$12 billion investment in advanced vehicle technologies, the Department is investing more than \$5 billion to electrify America's transportation sector. These investments under the American Recovery and Reinvestment Act and DOE's Advanced Technology Vehicle Manufacturing (ATVM) Loan Program are supporting the development, manufacturing, and deployment of the batteries, components, vehicles, and chargers necessary to put millions of electric vehicles on America's roads.

The Recovery Act included \$2.4 billion to establish 30 electric vehicle battery and component manufacturing plants and support some of the world's first electric vehicle demonstration projects. For every dollar of the \$2.4 billion, the companies have matched it at minimum dollar for dollar. Additionally, DOE's Advanced Research Projects Agency-Energy (ARPA-E) is providing over \$80 million for more than 20 transformative research and development projects with the potential to take batteries and electric drive components beyond today's best technologies, and the Advanced Energy Manufacturing Tax Credit program is helping expand U.S.-based manufacturing operations for advanced vehicle technologies.

The Obama Administration has also provided nearly \$2.6 billion in ATVM loans to Nissan, Tesla and Fisker to establish electric vehicle manufacturing facilities in Tennessee, California and Delaware, respectively.

Projects have now begun constructing new manufacturing plants, adding new manufacturing lines, building electric vehicles, and installing electric vehicle charging stations, creating thousands of new jobs across the country. These combined investments are helping the economy grow now, while positioning the U.S. for global leadership in the electric vehicle industry for years to come.



Recovery Act Investments in Electric Vehicles

Through the Recovery Act, the country is making comprehensive investments in each part of the electric vehicle ecosystem. In sum, the Act included approximately \$4 billion to support domestic manufacturing and deployment for advanced vehicle and clean fuel technologies. To date, there have been over 70 awards, worth more than \$2.5 billion, to promote electric vehicle technologies. This includes cost-shared projects at each level along the innovation chain – from battery and component manufacturing to commercial deployment of vehicles and charging stations to advanced research and development that will help identify the next generation of electric vehicle technologies.

- **Manufacturing** – 26 of 30 battery and component manufacturing plants have started construction, which includes breaking ground on new factories or installing new equipment in existing facilities.
 - 9 battery manufacturing projects, including a \$249 million project by A123 to support the construction of 3 Michigan facilities to produce advanced batteries for vehicles, grid storage, and other applications. They have already started construction of a low-volume manufacturing facility in Livonia, which they expect to begin operations in September, and have begun planning for larger-volume facilities in Romulus and Brownstown, Michigan. Nine of the nine new battery plants opening as a result of Recovery Act investments will have started construction by tomorrow – and four of those will be operational by the end of the year.
 - 11 battery component manufacturing facilities, including Celgard LLC in North Carolina, who won a \$49.2 million grant to expand its production capacity for separators, a key component in the lithium-ion batteries needed for the growing electric drive vehicle market. When Celgard completes expanding its facility in Charlotte, North Carolina, the company will be able to produce an additional 80 million square meters of separator per year—enough to support up to a million electric-drive batteries per year. Celgard is also building a new manufacturing facility in Concord, North Carolina to support additional increased demand for electric vehicle batteries.
 - 10 electric drive component manufacturing projects, including Delphi Automotive Systems, the largest North American supplier of power electronic components for electric vehicles. The company received \$89.3 million in Recovery Act support to build a power electronics manufacturing facility in Kokomo, Indiana. The plant will have the production capacity to support at least 200,000 electric drive vehicles by the end of 2012.



- **Deployment** – 8 innovative demonstration projects, representing the world’s largest electric vehicle demonstration to date. In total, these projects will lead to an additional 13,000 grid-connected vehicles and 20,000 charging stations in residential, commercial and public locations nationwide by December 2013.
 - Coulomb Technologies received a \$15 million Recovery Act grant to support the ChargePoint America program, which will deploy 5,000 residential and commercial charging stations and 2,600 electric drive vehicles in nine major metropolitan areas around the country.
- **Advanced Research and Development** - More than 20 breakthrough research projects to support potential game-changing technologies like semi-solid flow batteries, ultracapacitors and “all-electron” batteries that could go well beyond today’s best lithium-ion chemistries are being funded. **If successful, these breakthroughs could cut battery costs by as much as 90 percent and expand vehicle range three to six-fold.** In turn, this would decrease the upfront cost of electric cars to roughly that of gas-powered cars and give them a longer range, likely further increasing demand for the vehicles in the long-term.
 - Fluidic Energy won \$5 million to pursue “metal air” batteries that could have 10 times the energy density of today’s lithium-ion technologies, at a third of the cost. The Scottsdale, Arizona company is working with Arizona State University to develop ultra stable new materials, or “wonder fluids” that could allow metal-air batteries to be successfully developed and deployed for the first time, enabling widespread deployment of low cost, very long range electric vehicles.

Taken together, the impact of these investments is greater than the sum of their parts. The investments interact to stimulate both supply and demand for electric vehicles. The investments are lowering barriers to ownership: driving down the cost of batteries while improving their functionality and building a network of charging stations. Meanwhile, they are actively putting more electric cars on the road and supporting the long-term domestic production of low-cost, clean energy vehicles.

Federal investments in electric vehicles are being matched by private sector funding, helping to move private capital off of the sidelines. This combination of private and public investments in advanced vehicles is stimulating economic growth, creating jobs in both the short- and long-term, and increasing the country’s global competitiveness.

These jobs represent a shift—the shift of important industries moving jobs back to American shores and the growth of a domestic battery industry. The Recovery Act is laying the groundwork for long-term, sustainable recovery by ensuring that the industries of the future are American industries. In 2009, the United States had only two factories manufacturing advanced



vehicle batteries and produced less than two percent of the world's advanced vehicle batteries. By 2012, thanks in part to the Recovery Act, 30 factories will be online and the U.S. **will have the capacity to produce 20 percent of the world's advanced vehicle batteries. By 2015, this share will be 40 percent.**

This shift has additional benefits, too. Today, oil provides 95% of the power to move America's cars, trucks, ships, rail, and planes, and over half of America's oil is imported. Electric vehicles and other advanced vehicle technologies can reduce this dependence and help the country control its energy future.

Electric Vehicle Supply Chains and Networks

Through the Recovery Act and the ATVM program, DOE is invigorating a nationwide advanced vehicle supply chain centered in the Midwest. Michigan is an example of how clusters can multiply the impact of Recovery Act funds and create synergies within and across corporate walls. A concentration of Michigan's engineers, workers, and managers are innovating more quickly because they are near one another – and drawing in more and more advanced vehicle expertise each day.

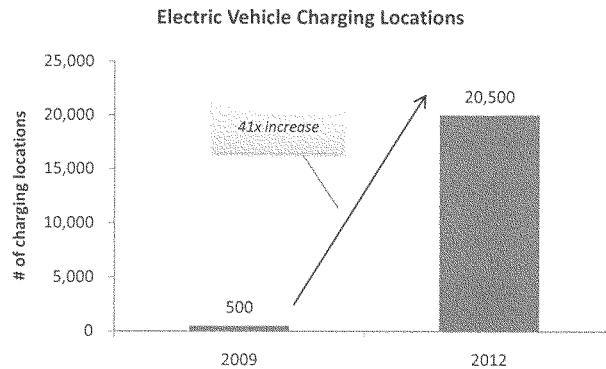
The Recovery Act is supporting 14 vehicle awards in Michigan. This includes several large battery factories (e.g. A123, GM, Johnson-Controls, Dow-Kokam, and LG Chem), electric drive component factories (e.g. GM, Ford, Magna), and three workforce training programs (University of Michigan, Michigan Technological University, and Wayne State). Under the Department's loan program, DOE is supporting multiple Michigan-based factories that will hire the workers trained in these universities to assemble the batteries and components into some of the world's most advanced vehicles.

For example, a \$105 million grant to GM is expanding a facility to package batteries for the Chevy Volt – the grant is creating hundreds of jobs at the Brownstown facility and invigorating a chain of local factories. GM will deliver batteries from Brownstown to a plant in Detroit. Here, hundreds of workers will assemble components made in Warren, Grand Blanc, and three factories in Flint. This network of Volt-related investments is attracting other companies to Michigan. To supply battery cells to the Brownstown facility, Compact Power, Inc. is building its first American factory in Holland, Michigan. The \$151 million grant is helping Compact hire workers in Holland and purchase battery components and supplies from U.S. factories. Compact will purchase its separator material from Celgard, and is evaluating other Midwestern suppliers for its other components like cathodes, electrolytes, additives, and binders.

Meanwhile, under the Recovery Act's Transportation Electrification program, grantees will deploy 20,000 additional electric charging locations, up from 500 locations today. These 8 demonstration projects are also putting 13,000 electric vehicles on the road, including more than



4,700 Chevy Volts, across more than a dozen cities to show how electric cars perform under real driving, traffic and weather conditions.



Innovation in Batteries

The Obama Administration's investments in advanced vehicles are creating a sustainable future for American industry and American workers. But investments in batteries demand special attention. The lack of affordable, highly-functional batteries has been a particularly high barrier to the widespread adoption of electric vehicles. When the Recovery Act passed, batteries were too costly, too heavy, too bulky and would wear out too quickly. Recovery Act investments are literally reshaping electric batteries and reshaping the economics of battery production and distribution.

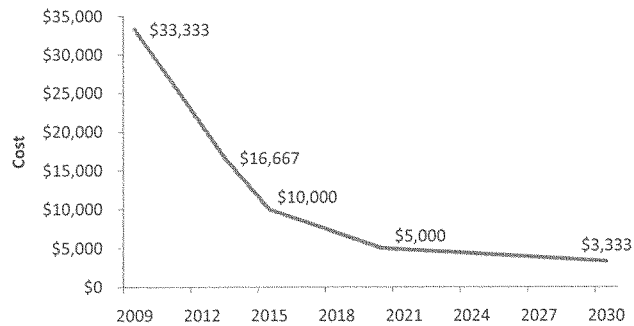
More Affordable

Before the Recovery Act, the only highway-enabled electric vehicle on the road cost more than \$100,000. This high cost resulted in large part from the high cost of batteries—a car with a 100 mile range required a battery that cost more than \$33,000.

Between 2009 and 2013, the Department of Energy expects battery costs to drop by half as 20 Recovery Act-funded factories begin to achieve economies of scale. By the end of 2013, a comparable 100 mile range battery is expected to cost only \$16,000. By the end of 2015, Recovery Act investments should help lower the cost of some electric car batteries by nearly 70 percent to \$10,000. The same cost improvement applies to plug-in hybrids – cars that can travel roughly 40 miles on electricity before their gasoline engine kicks in. The cost of a 40-mile range battery is falling from more than \$13,000 in 2009, to roughly \$6,700 in 2013, to \$4,000 in 2015.



Forecasted Cost of a Typical Electric-Vehicle Battery



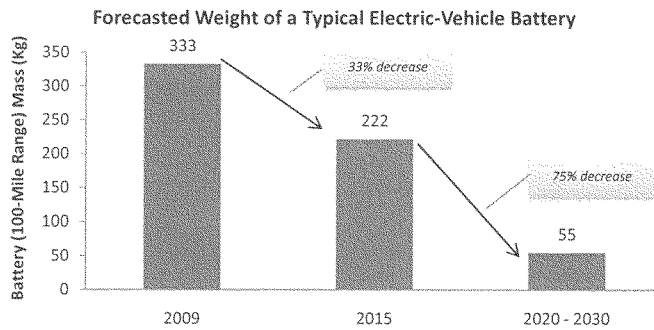
Note: Assumes 3 miles per kilowatt hour and 100-mile range. Source: U.S. DOE Vehicle Technologies Program.

This dramatic drop in cost should result in more affordable, mainstream electric cars. Fisker, GM, Nissan, Tesla, and other automakers are introducing more affordable electric vehicles. At the end of this year, consumers will be able to purchase electric vehicles that cost between \$25,000 and \$35,000, after tax credits. In addition, drivers will save money over a car's lifetime. Using electricity to power a car is only about 30 percent of the cost of using three-dollar-a-gallon gasoline.

Lighter Weight

Low energy density, i.e. heavier batteries, significantly limits vehicle range and acceleration. Under the Recovery Act, DOE is supporting innovations to reduce battery weight and increase the energy density, which allows batteries to store more energy in a smaller, lighter package. These smaller, lighter batteries will pack **more power, performance, and range**.

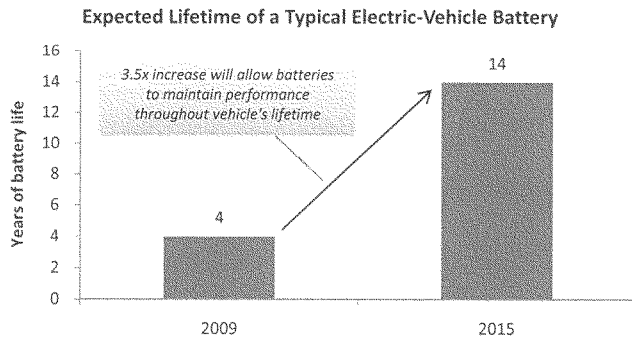
Between 2009 and 2015, increases in energy density will reduce the typical weight of an electric vehicle battery by 33 percent. Meanwhile, ARPA-E projects are pursuing innovations that have the potential to improve battery density up to six times its current level.



Note: Assumes 3 miles per kilowatt hour and 100-mile range. Source: U.S. DOE Vehicle Technologies Program.

Longer Lasting

Batteries are also getting more durable. In the next few years, domestic manufacturers should be able to produce batteries that last up to 14 years. This should give consumers confidence that electric vehicle batteries will last the full life of the vehicle. In addition, longer lasting batteries reduce the potential for used batteries to become waste material.¹



Note: Assumes drivers will charge their vehicles 1.5 times per week. Source: U.S. DOE Vehicle Technologies Program.

¹ Calendar life is assumed for advanced electric vehicle battery technologies. Current batteries for PHEV vehicles are designed to achieve significantly higher calendar life, but trade-off performance and cost to achieve that life.

Senator CARPER. Thank you very much for your presence and for your testimony.

Mayor, one question I have for you, Mayor Homrighausen, are you Irish?

[Laughter.]

Mr. HOMRIGHAUSEN. No, I am not.

Senator CARPER. Just checking. All right. But you are recognized and we welcome your testimony.

STATEMENT OF RICHARD P. HOMRIGHAUSEN, MAYOR, CITY OF DOVER, OH

Mr. HOMRIGHAUSEN. Senator Carper.

Senator CARPER. Willkommen.

Mr. HOMRIGHAUSEN. Good morning. My name is Richard P. Homrighausen and I am the Mayor of the city of Dover, OH, the inland Dover. Dover is located in the heart of the industrial Midwest and I believe our experiences are shared by a great number of small to mid-sized municipalities across the region.

In addition to providing traditional city services, Dover owns and operates its own municipal electric system. We are a city with a population of just under 13,000, but have over 950 businesses ranging from mom and pop stores to Fortune 500 companies. A key factor in attracting and retaining these businesses is our local utility and the generation within our City limits. During the 2003 Midwest blackout, the lights stayed on in Dover.

Providing reliable and affordable electricity is an important mission for the city of Dover. But it has come with its challenges. Lately, most of these challenges are from new and proposed Clean Air Act regulations. The city of Dover gets its electric supply from units directly owned by the City, some jointly owned units, as well as electricity purchased through our membership in American Municipal Power, or AMP, which has helped diversify our power supply portfolio.

Even with the planned diversification of our electric energy, Dover remains highly dependent on Midwest, coal-fired generation and the cornerstone of the City's electric system is the City-owned 16 megawatt coal-fired base load powerplant. Dover's other local generation resources include both natural gas and diesel generators. Together with our coal plant, our on-site capacity means we can meet approximately 37 percent of our electricity locally.

Unlike large investor-owned utility companies, Dover does not own a fleet of large powerplants that we can selectively control or shut down in response to new emissions control requirements. We have limited response options to such regulations. Put simply, the cumulative impact of EPA's rulemakings could put us in the position of deciding to either spend millions of additional dollars on plant upgrades or shut down our local generation. Neither option is acceptable to us. But to protect our community, the latter decision is one we especially hope to avoid.

Despite Dover's ongoing investments in our local generation, we are struggling to keep up with the rapid pace of new EPA rules. Each has a significant impact on us, and the cumulative effect is potentially devastating. Compliance with three final or pending

EPA rules alone is expected to cost the city of Dover millions of dollars.

I commend Senator Inhofe for introducing the CARE Act to require a review of the total costs of major EPA regulations. Jobs are at risk. The loss of additional high-paying manufacturing jobs in local communities already suffering under the current economic downturn would be devastating.

The unemployment rate in Tuscarawas County for January 2011 was 10.7 percent, up from 9.8 percent the month before and well above the national average. While Tuscarawas County is currently in attainment for all criteria pollutants, some neighboring counties are not as lucky. It could be only a matter of time, or wind currents, before our home county could also be subject to the economic development limitations that come with non-attainment status. Such non-attainment limitations would have major impacts, especially on our chemical and plastic industries which employ hundreds of workers.

We are particularly concerned about the unknown costs associated with compliance with yet-to-be-determined regulations to control greenhouse gases. While EPA has touted the benefits of carbon capture and storage for coal-fire generation, this technology is not commercially available and would certainly be uneconomical on a plant our size.

Increased energy efficiency is one way to reduce emissions. However, in order to make energy efficiency a viable option, EPA needs to address the current New Source Review Rules that prevent electric utilities from modifying the existing plants to improve efficiency.

Given huge uncertainties and potential costs associated with greenhouse gas regulation, I applaud Senator Inhofe for introducing the Energy Tax Prevention Act of 2011 to preclude EPA from using the Clean Air Act to regulate greenhouse gases. Instead, any climate change policy should be developed by Congress and must balance environmental goals with impacts on consumers and the economy.




While some see natural gas as the fuel that will be used to replace lost coal capacity, it certainly cannot provide full replacement in the near term. In the long term, increased demand will lead to increased prices. Our use of regional coal for electricity generation has enabled us to effectively contribute to the national economy and create and maintain jobs. When 50 percent of our Nation is powered by coal, it would be foolish to shut coal out as a resource option.

All of us share a concern about the environment. As a local official, I want to make sure that the Dover of tomorrow is even better than the Dover of today. The Clean Air Act has resulted in huge improvements in air quality that have benefited all of us.

But environmental regulations must be tempered by economic realities. Unfortunately, EPA's recently issued proposed rules are creating a regulatory train wreck for electric utilities that use coal.

Thank you for the opportunity to testify and I am happy to answer any questions you may have.

[The prepared statement of Mr. Homrighausen follows:]

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<p>STATEMENT OF RICHARD P. HOMRIGHAUSEN MAYOR, CITY OF DOVER, OHIO</p> <p>BEFORE THE SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY AND THE SUBCOMMITTEE ON GREEN JOBS AND THE NEW ECONOMY OF THE ENVIRONMENT AND PUBLIC WORKS COMMITTEE UNITED STATES SENATE</p> <p>JOINT HEARING ON "THE CLEAN AIR ACT AND JOBS"</p> <p>MARCH 17, 2011</p> <p style="text-align: center;"> TREE CITY USA</p>		

Good morning, Chairman Carper, Chairman Sanders, Ranking Member Barrasso, Ranking Member Boozman, members of both subcommittees, ladies and gentlemen.

My name is Richard P. Homrighausen, and I am the Mayor of the City of Dover, Ohio. I have had the honor of testifying before the full Environment and Public Works Committee on three previous occasions, and I thank both subcommittees for the invitation to appear before you today to discuss the targeted impacts that various EPA regulations are having, and are expected to have, on jobs and our local economy in East Central Ohio.

Dover, Ohio, with a population of 12,826 based on the 2010 census, is located in the heart of the industrial Midwest, and I believe our experiences are shared by a great number of small to mid-sized municipalities across the region. There are more than 950 commercial, industrial, and institutional business interests located in the City of Dover. In addition to providing traditional city services, Dover also owns and operates its own municipal electric system, Dover Light and Power, which celebrated its 100th anniversary in 2010. Providing reliable and affordable electricity to our homes and businesses is an added responsibility for the City of Dover, and it has come with its challenges. Lately, most of those challenges have directly resulted from the myriad of environmental regulations proposed and / or enacted by the U.S. Environmental Protection Agency (EPA) under the Clean Air Act.

The City of Dover's electric system is supported by electric generation units directly owned by the City, some jointly owned units, as well as electricity purchased through our membership in American Municipal Power, Inc. (AMP). AMP is a wholesale electricity and services provider for 128 member municipal electric systems located in Ohio and five other states. Dover's membership in AMP has enabled us to benefit from a more diversified power supply portfolio than what we could have developed by ourselves, which includes renewable as well as fossil

resources. Over the next several years, Dover's participation in AMP-developed projects is expected to add approximately 18.7 MW of new coal, hydroelectric, and solar capacity to our power supply portfolio.

Even with the planned diversification of our energy portfolio, Dover is still highly dependent on cost-effective Midwestern coal-fired generation. Dover is located in coal country, and the cornerstone of the City's electric system is the City-owned, 16-MW coal-fired baseload power plant. Through its membership in AMP, Dover also is a participant in the Prairie State Energy Campus, a new 1600-MW baseload coal plant currently under construction in Illinois and scheduled to commence commercial operation of the first unit later this year. Once completed, Prairie State will supply Dover with approximately 5 MW of some of the cleanest coal-fired capacity in the nation. In addition to these Dover and AMP projects, Dover obtains approximately 23% of its power supply needs from the wholesale electric market. In our region of the country, the Energy Information Administration (EIA) estimates that approximately 72% of these wholesale market purchases come from coal-fired generation units. Thus, regulations that impact any coal units in our region are expected to impact the cost of electricity for Dover and our customers.

Dover's other local generation resources include an additional 16.2 MW of "stand-by" electricity that can be generated by our natural gas turbine. We have seven diesel generators with a total capacity of 13.4 MW. Four of these diesel units are solely owned by the City, and three are jointly owned by the City and AMP.

With our on-site capacity, we are able to generate approximately 37% of our electricity demand locally. The reliability and energy security value of these local power generation resources was reinforced by the August 2003 blackout in our part of the country. While surrounding communities were without power for hours, and in some instances days, Dover never lost power. But the benefit of having and maintaining local generation comes with significant costs to the City, particularly

compliance costs related to an ever-increasing array of environmental regulations on our fossil – and especially coal-fired – generation resources.

Unlike larger investor-owned utility companies, Dover does not own or have access to a fleet of power plants that we can selectively control or shut down in response to new emission control requirements. Thus, environmental regulations on coal-fired generation resources can have a greater impact on the power supply decisions made by municipal electric systems such as ours, because we have limited response options to such regulations. Put simply, EPA's rulemakings can put us in the untenable position of deciding to either spend millions of dollars on the plant upgrades necessary to assure compliance, or shut down our local generation capacity. While neither option is acceptable to us, the latter decision is one we especially hope to avoid, as it would result in loss of local decision-making and control of our power supply, increased vulnerability to volatile electricity markets, eventually higher electricity costs to customers, and direct job losses at our power plant. Because business decisions are most often related to their costs, we can only expect that significant electricity cost increases in Dover would also result in negative economic impacts for our energy-intensive business customers.

Over the years, Dover has invested significant time and resources in order to position our local power generation to continually advance in a logical, measured way that assures both reliability and environmental stewardship while maintaining costs.

For instance, Dover was the first municipal electric utility in the nation to utilize natural gas co-firing at its 16-MW coal plant. Dover partnered with the Department of Energy (DOE) and Coen Company in a clean coal demonstration project at our coal-fired plant by adding two natural gas-fired burners in the furnace to reduce emissions during operations. As an added benefit, the burners allowed Dover to start up and transfer to coal with minimal to no opacity excursions and greatly reduced emissions. The cost to the City of Dover for this project was \$200,000.

As another example, in 2007, Dover demolished and removed three antiquated boilers from the power house in order to create space for the installation of new, state-of-the-art clean coal generation, should it become affordable. Unfortunately, that space remains empty, in part because rising environmental compliance costs for coal units have essentially priced new, local, clean coal-fired generation beyond our reach.

In 2008, Dover completed installation of a baghouse on our 16-MW coal-fired unit. The \$6.15 million project greatly reduced both particulate emissions and opacity.

However, despite Dover's ongoing efforts, we are struggling to keep up with the rapid pace by which EPA is issuing rules that each have a significant impact on us and cumulatively are potentially devastating, as I will explain.

Industrial Boiler MACT

Because Dover's coal plant is below 25 MW of capacity, it is subject to the Industrial Boiler MACT rule, which was finalized by EPA last month. Four other Ohio municipal electric systems have boilers covered under the Industrial Boiler MACT rule (Hamilton, Orrville, Painesville, and Shelby). This rule was proposed by EPA in June 2010 under a court deadline to establish maximum achievable control technology (MACT) standards for thousands of industrial / commercial / institutional boilers and process heaters commonly found throughout the nation's manufacturing sectors, including chemicals, petroleum, biofuels, pulp and paper, furniture, rubber, aluminum, and agricultural processing sectors, and, in addition to municipalities, institutions such as hospitals and prisons, universities, federal governmental facilities, and commercial entities. Many of these entities have manufacturing facilities or other sizeable operations located in Dover.

During the comment period, EPA received thousands of comments requesting modifications aimed at decreasing the devastating impacts and compliance costs. For example, EPA was encouraged to include a special subcategory for small municipal utilities to address the unique challenges faced by these small communities. While EPA agreed to consider small entity issues in the Industrial Boiler MACT rule, the agency did not establish a small utility subcategory as requested. Instead, EPA set stringent numeric emission limits based on the “best performing” industrial boilers without evidence that municipal utility boilers – which have different operating objectives – can achieve these limits.

EPA also did not include a practical, health-based compliance alternative that the agency itself estimated would save \$2 billion in compliance costs with no resulting detrimental impacts to human health or the environment. In a prior version of this rule, stringent hydrogen chloride (HCl) emission limits did not apply to sources that could demonstrate that emissions posed no adverse risk beyond facility fence lines. Several municipal utilities such as Dover would have been eligible for this demonstration, which would have saved us an estimated \$2 million in installation costs for HCl controls, plus \$367,000 in annual O&M costs for our Boiler #4. Unfortunately, under significant pressure from environmental organizations, EPA declined to include the health-based option despite the fact that Congress gave EPA the discretion to treat HCl differently from other compounds. Health-based relief presents an opportunity to reduce the significant cost burden on small municipal generators without causing any harm to human health or the environment.

Jobs are at risk. An unreasonable and unworkable Industrial Boiler MACT rule could place thousands of manufacturing jobs across the country at risk because of the high cost of compliance – estimated at over \$20 billion in capital costs alone, based on the proposed rule. This could amount to over 18,500 potential jobs at risk in Ohio alone, based on the IHS Global Insight study entitled, “The Economic

Impact of Proposed EPA Boiler / Process Heater MACT Rule on ICI Boiler and Process Heater Operators," August 2010 (it should be noted that this study was based on the rule as proposed; an updated analysis of the final rule has not been completed at this time).

The loss of stable, high-paying manufacturing jobs in local communities already suffering under the current economic downturn is devastating. The unemployment rate in Tuscarawas County for January 2011 was 10.7%, up from 9.8% the month before and well above the national average. Businesses in communities with impacted municipal electric generators, such as Dover, will be doubly hurt and will pay for the new Industrial Boiler MACT rule both through direct compliance costs and through increased local electric rates.

RICE NESHAP

Since it was first proposed in February 2010, EPA's new rule (finalized in August 2010) establishing a National Emissions Standard for Hazardous Air Pollutants (NESHAP) for reciprocating internal combustion engines (RICE) has generated significant opposition from various sources categories, including public power.

In communities, the types of facilities that are likely to have RICE engines that will be impacted by the rule include public water plants, wastewater treatment plants, and engines used to start combustion turbines; also included are RICE engines used for electric system peak shaving or demand response programs. Dover has six RICE units which are jointly owned by the city and AMP, and six units owned and operated by the City of Dover, as follows: one diesel at the City's wastewater treatment plant, one diesel at the City's water treatment plant, and a total of four units at the City's coal-fired power plant (one air compressor, one gas compressor, one diesel start-up unit for the gas turbine generator, and one diesel generator).

In December 2010, EPA issued a Notice of Reconsideration on a limited section of the final rule to allow for additional public comments to address issues related to the use of RICE units for voltage support and other essential functions to support

local electric systems and prevent power outages. EPA's definition of what constitutes and triggers an "emergency" was also open for comment.

It was clear from a public meeting held by EPA in January 2011 that the agency did not have enough information to fully appreciate the importance of RICE units to the safe and reliable operation of local electric systems when it proposed and later finalized the rule. Municipal systems such as Dover have concerns that the rule, if left unmodified, will inadvertently adversely impact local and regional power supply and system operations. The essential, though relatively infrequent, operation of these units (in terms of hours per year) attests to the need to modify the rule's definition of "emergency" to accommodate their role in maintaining a safe and reliable electric generation, distribution, and transmission system. Further, by addressing the "emergency" definition, EPA can remove some of the concerns regarding the cost of complying with the new rule and impacts on our customers, which have been estimated by EPA to be approximately \$100,000 per RICE unit (or approximately \$600,000 combined for the City's six RICE units).

COAL ASH

EPA issued this proposed rule in June 2010 in response to a single wet coal-ash impoundment failure in Tennessee in 2008 and is currently evaluating comments filed. EPA asked for public comment on two approaches available under the Resource Conservation and Recovery Act (RCRA) for addressing the perceived risks of coal-ash management. Subtitle C regulation would treat coal combustion by-products (CCBs) as hazardous wastes under RCRA, thus subjecting them to specific disposal requirements and likely eliminating any recycling options, while Subtitle D regulation would present less stringent disposal requirements. EPA openly stated that the intended goal of both options is to shift disposal options away from wet storage (ash ponds) to dry storage (landfills) of waste. Both proposed options would set requirements for existing and new impoundments. Both proposals would require on a national basis that liners and ground water monitoring are in place at new landfills handling coal ash, in order to prevent leaching of

contaminants to groundwater and resulting risks to human health, and would have requirements for closure and post-closure care.

The EPA is proposing to adopt the same approach for new and existing landfills under RCRA Subtitle D as it is proposing under RCRA Subtitle C – i.e., the same minimum design requirements for new landfills (or new portions of existing landfills). Existing landfills receiving CCBs after the effective date of the final rule would not be required to be retrofitted with a new minimum technology liner and leachate collection and removal system, or to close as long as the system is meeting groundwater monitoring requirements.

Dover disposes of its coal ash at an approved ash landfill about 65 miles away from the power plant, at Richmond Mills, in Richmond, Ohio, at a cost of \$15.50 per ton. These disposal costs are projected to double, if not triple, if the proposed new regulations are finalized.

The City of Dover and our customers are potentially facing millions of dollars in compliance costs with these and other new regulations issued by the EPA relating to NO_x, SO₂, greenhouse gases (GHGs), and hazardous air pollutants. Some of these expenses will be directly imposed on our coal plant, while others will be borne by the City as a result of our participation in other electric generation projects being developed by AMP. In addition, these environmental compliance costs will be borne by our industrial, commercial, and institutional customers – both due to their own compliance with many of these regulations as well as through the increased cost of electricity due to such compliance upstream. Residential customers will likely see these costs in increased electricity prices as well as increased prices for purchased goods and services.

While Tuscarawas County is currently in attainment for all criteria pollutants, some neighboring counties are not as lucky, and it could be only a matter of time – or wind currents – before our home county also could be subject to the economic

development limitations that come with nonattainment status. For example, increased traffic and congestion on I-77, which runs through Dover, could lead to an ozone non-attainment designation at some point in the future, which would be expected to require a costly new vehicle inspection and maintenance program for the county, as well as other limitations on emissions of NO_x and volatile organic compounds (VOCs), the components of ozone. Such limitations could have major impacts especially on our chemical and plastics industries, which employ hundreds of workers locally.

We are particularly concerned about the unknown costs associated with compliance with yet-to-be-determined regulations to control GHGs, which EPA is in the process of developing. New Source Performance Standards (NSPS) for GHGs from utility units (both new and existing, and including both coal and natural gas units) are expected to be voluntarily proposed by EPA in July. While EPA has touted the benefits of carbon capture and storage technology for GHG control from coal-fired power plants, this technology is not currently commercially available, and only a handful of large utilities are in the process of conducting research projects on its applicability and practicality, mostly with sizable federal funding assistance as well as sizable parasitic losses.

EPA has also promoted the use of energy efficiency as a possible solution to reducing GHG emissions. In Dover, we view increasing energy efficiency – both on our system and at the end user – as our least expensive power supply option. Energy not needed is energy that does not have to be built or maintained. Over the years, we have changed out our old street lights for more efficient models, which translates to nearly 200 tons of coal annually that the City does not have to purchase – and our power plant does not have to burn. In addition, Dover is a full participant in AMP's new EfficiencySmart program, and the City will invest nearly \$1 million over the next three years on incentives and technical assistance to help our customers reduce their electricity use. The program is projected to reduce demand by more than 2700 MWh over the first three years. Increased energy

efficiency is one way to reduce emissions, but it can be most effective on the supply (i.e., power plant) side of the equation. However, in order to make energy efficiency a viable option, EPA needs to address the current New Source Review (NSR) rules that prevent electric utilities from modifying existing plants to improve efficiency.

Given the huge uncertainties and potential costs associated with GHG regulation, I applaud Senator Inhofe for introducing S. 482, the Energy Tax Prevention Act of 2011. This bill would preclude EPA from using the Clean Air Act to regulate GHGs. Instead, Congress should take the responsibility of developing new legislation to address climate change on an economy-wide basis that balances environmental goals with impacts on consumers and the economy.

There have been a number of recent studies that show a significant reduction in electric generating capacity resulting from GHG and other regulations under the Clean Air Act. Just last week, Barclays Capital estimated that coal capacity would decline by 30 GW within the next four years. Other recent reports have included much higher estimates (for example, over 100 GW in coal-fired retirements by 2020, from an EEI / ICF International analysis, January 2011). The impacts of these retirements will affect electricity capacity most in coal-dependent regions of the country. While natural gas is projected as the fuel that will be used to replace some of the lost capacity, it certainly cannot provide full replacement in the near term, and increased demand will lead to increased prices. Coal retirements, particularly in our part of the country, will inevitably increase our reliance on volatile wholesale electric markets, as discussed previously. Even without those direct environmental compliance costs associated with our coal-fired power plant, Dover and its customers will end up paying for compliance by other electric generators throughout the region with all these environmental regulations.

All of us share a concern about the environment. As an elected official with responsibilities to my community and its citizens, I want to make sure that the

Dover of tomorrow is even better than the Dover of today – this is our commitment to our citizens and our environment. We strive for a sustainable community. We need to be able to make careful, informed decisions that will enable our community to grow and prosper, but these decisions are increasingly difficult in the current climate of uncertainty and regulatory overreach by the EPA.

It is important to note that the “one size fits all” premise does not work at all when it comes to energy policy, or for that matter the environmental policies which far too often seem to drive energy policy decisions. The diverse and regional nature of our energy resources has contributed to the diverse and regional economies that drive our nation’s economic development. The Midwest’s industrial base, for example, supplies products throughout the nation and is highly sensitive to electricity prices in a global market. Our use of regional coal for electricity generation has enabled us to effectively contribute to the national economy and create and maintain jobs. The nation as a whole cannot shut coal out as a resource option -- not if we also want to maintain our national goals of energy independence, reliability, and affordability.

The Clean Air Act has resulted in huge improvements in air quality since the 1970s, and we have all benefited from those improvements. But environmental regulations must be tempered with economic realities. The Clean Air Act itself embraces this principle through the use of cost / benefit analysis in the regulatory process. Unfortunately, EPA’s recently issued and proposed rules are creating a regulatory “train wreck,” resulting in a piling on of regulatory burdens for electric utilities that use coal specifically. This approach is more likely to result in lengthy legal battles than in cleaner air.

Thank you for the opportunity to provide some local government and electric utility perspective on this important issue. I will be happy to answer any questions you might have.

DLP by the numbers

Assets	5,100
Trucks	1,000
Service Centers	1,000
Security Lights	4,000
Overhead Lines	70 miles
Underground Lines	1.5 miles
Total assessed value to #100	\$25,332,300

Steps in the chain of electric service

Generation of Power
Transmission Line
Distribution Line
Substation
Transformer
Overhead Line
Underground Line
Service Drop
Meter
Service Entrance
Customer

Partnerships in Power

American Municipal Power
Ohio Municipal Electric Association
AMPE
OMEA

Celebrating Dover's 100 Years of Public Power

dlop
ESTABLISHED: 1910

A Word from the Mayor

Richard H. Houghausen
Mayor, City of Dover, Ohio

As the Mayor of Dover, Ohio, I am proud to be a part of the 100th anniversary of the City of Dover's Public Power. The City of Dover has a rich history of providing reliable and affordable electric service to our residents and businesses. The City of Dover's Public Power is a testament to the hard work and dedication of our employees and the support of our customers. We are committed to providing the highest quality of service to our customers and to maintaining the safety and reliability of our electric system. We are proud to be a part of the City of Dover's Public Power and to the many achievements that we have accomplished over the past 100 years.

Senator CARPER. Thanks so much.
Mr. Allen, you may proceed.

**STATEMENT OF PAUL J. ALLEN, SENIOR VICE PRESIDENT OF
CORPORATE AFFAIRS AND CHIEF ENVIRONMENTAL OFFI-
CER FOR CONSTELLATION ENERGY**

Mr. ALLEN. Thank you very much.

Let me begin by saying that Constellation Energy operates a highly-diversified portfolio of electric generating facilities, about 12,000 megawatts of installed capacity. In addition to five nuclear units, our other generating assets include coal-fired capacity, natural gas plants, wind, solar, biomass and hydroelectric generation. All of our generating assets are merchant plants. We believe strongly in competitive markets where we need to be a low-cost provider in order to prosper.

Because of our broad involvement in so many aspects of the energy equation, we recognize that the central challenge for our industry is balance in the three imperatives of energy, affordability, reliability and sustainability. We believe that in solving this equation, clean air safeguards can and must be compatible with the first two imperatives.

We know that meeting this challenge requires clear, commercially-feasible rules for environmental performance and significant capital investment. Of course, many jobs are entailed in implementing those investments. To illustrate, I will briefly describe our experience at Brandon Shores, a powerplant in Maryland where we have constructed a state-of-the-art air quality control system.

Brandon Shores is a very large powerplant, two 640 megawatt coal-fired units, has a highly efficient turbine closed cycle cooling towers, electrostatic precipitators that remove over 99 percent of particulates contained in the flue gas, selective catalytic reduction and other equipment for nitrogen oxide reduction, achieving a 90 percent reduction in NOx. We beneficially re-use 85 percent of the coal combustion fly ash by making it into concrete.

In short, Brandon Shores was a highly efficient, well functioning, environmentally sound electric generation source before the State of Maryland, under Governor Bob Ehrlich, passed its Healthy Air Act in 2006 which was finalized by the O'Malley Administration, as you heard Senator Cardin say, in July 2007.

Working with the Maryland Department of the Environment, Brandon Shores now meets all of the requirements of that law, which are perhaps the most stringent and most plant-specific requirements in the country. The Healthy Air Act aimed to make deep reductions in nitrogen oxide and sulfur dioxide emissions and aimed to reduce mercury emissions by 90 percent by 2013 from a 2002 baseline.

To accomplish these further reductions, Constellation constructed an additional, even more comprehensive air quality control system at Brandon Shores consisting mainly of a Flue Gas Desulfurization System, commonly called a wet scrubber, plus a Pulse Jet Fabric Filter, commonly called a bag house, with sorbent injection.

The new scrubber installation and other environmental controls have the capability to remove at least 95 percent of existing sulfur

dioxide, 90 percent of existing mercury, and the NOx controls are already in place and at the new targets of the Healthy Air Act.

Construction of this scrubber entailed building a new, single 400-foot emissions stack with two flues, capping the two existing stacks so that all flue gas must exit through the scrubber. We constructed hydrated lime and powder activated carbon injection systems for sulfuric acid mist and mercury removal.

One of the really unique features of our project is the use of brown water from a neighboring municipal waste treatment plant. Of course, many hundreds of feet of the air duct work was built and connected to massive fans, pumps and motors.

Groundbreaking for the construction phase of the project began in June 2007. Construction was completed in September 2009, about 26 months. The total cost was approximately \$885 million. We have spent more than \$1 billion in air pollution control equipment for our portfolio of coal-fired powerplants in Maryland.

At peak construction, 1,385 personnel were employed on the site. These were skilled craft and construction workers including boiler-makers, steamfitters, pipe fitters, operating engineers, millwrights, iron workers, electricians and master electricians, as well as carpenters, teamsters and laborers. We worked closely with the building trades and other unions to accomplish this job in good time and with an outstanding safety performance and we met the regulatory timeline.

Over the course of the 26-month construction phase, we used approximately 4.3 million man hours and that equates to about 1,600 job years. These are the hours worked by the contract employees that built the project. It does not reflect the manufacturing jobs associated with the technologies and equipment that our team assembled.

The manufacturers of the cranes and vehicles deployed on the site, the manufacturers of the many large and small components from booster fans, pumps and pump motors to ball mills, electronics, wiring, steel, concrete, and specialty tile for the flue gas stack certainly employed many thousands of individuals to make these goods and operate the companies that form the supply chain for this kind of infrastructure.

Combined with the men and women of Constellation who operate our powerplants, the engineers and physicists and the BGE linemen and pipeline technicians, the customer care and service representatives and the internal teams who support these skilled individuals, we create the jobs that are the backbone of the grid. Indeed, these are the jobs and careers that help form the backbone of the American economy.

It is this experience, and the empirical evidence of man hours hired and paid, emissions measured and lowered, megawatts successfully produced and marketed that give us the confidence that we, and our sister companies in the electric power industry, can continue to deliver affordable electricity with the great reliability that all consumers depend upon while also meeting the air quality requirements set forth in the Clean Air Act.

I have run over a little. Thank you very much and I will be happy to answer questions.

[The prepared statement of Mr. Allen follows:]

**Testimony of Paul J. Allen
At the Joint Hearing
Of the U.S. Senate Subcommittees on
Clean Air and Nuclear Safety, Environment and Public Works, and
Green Jobs and the New Economy
March 17, 2011**

Chairman Carper and Chairman Sanders, members of the subcommittees, thank you for inviting me to participate in this hearing on the subject of clean air safeguards and the jobs associated with meeting those safeguards. I am the senior vice president for corporate affairs and chief environmental officer for Constellation Energy. It is a privilege to talk with you today. I am here today to speak to our recent experience building large, comprehensive air quality control systems on coal fired power plants. I will share with you some of the dimensions of the work and the jobs involved in meeting the regulatory timeline for the project.

Let me first offer some relevant background concerning Constellation Energy.

Headquartered in Baltimore, Maryland, Constellation Energy is a national provider of electricity, natural gas, energy efficiency services, demand response and energy technology solutions. We operate a diversified portfolio of electric generating facilities amounting to approximately 12,000 megawatts of installed capacity. This includes our joint venture with EDF (Electricite de France), called Constellation Energy Nuclear Generation (CENG). CENG owns and operates five nuclear units at three locations: two units in Maryland at the Calvert Cliffs Nuclear Power Plant in Lusby, Maryland and three units in New York State, including the R.E. Ginna Nuclear Power Plant near Rochester and the Nine Mile Point Nuclear Power Plant near Oswego. Our other generating assets include coal-fired capacity, natural gas-fired capacity, wind, solar, biomass and hydroelectric generation.

Our commercial enterprise, Constellation NewEnergy, supplies energy products and solutions to more than 30,000 industrial and commercial retail electric and natural gas customers in competitive markets, as well as to residential retail customers in several states across the

country. Constellation NewEnergy is the market leader in competitive retail and wholesale electricity markets.

Constellation also owns BGE, the Baltimore Gas and Electric Company, which serves 1.2 million electric customers and 600,000 natural gas customers in central Maryland. BGE was founded in 1816 and is the oldest, continuously operating energy utility in North America.

At Constellation we believe strongly in competitive markets for energy service. We are significant participants in the organized markets of PJM, ERCOT, the New York ISO, New England ISO, MISO and the Cal ISO.

We are also active participants in environmental and sustainability policy discussions at the federal, state and local levels. We have clearly defined internal environmental policies and goals. We have a deep commitment to environmental stewardship. We are proud of the solutions we provide customers to help them meet their sustainability and stewardship goals, including a major smart-grid initiative now underway at BGE; and innovative new technologies such as “VirtuWatt,” a proprietary software and technology package, which helps Constellation’s commercial and industrial customers actively manage their energy use in real time, thereby saving them money and lowering overall peak demand.

Because of this broad involvement in so many aspects of the energy equation, Constellation Energy recognizes that the central challenge for our industry is balancing the three imperatives of energy affordability, reliability and sustainability. We believe that in solving this equation, clean air safeguards can be compatible with the other two imperatives. We know that meeting this challenge requires clear, commercially and industrially feasible rules for environmental performance. Meeting this challenge also requires significant capital investment – and many jobs are entailed in implementing those investments. To illustrate what this means, please allow me to describe our experience at the Brandon Shores power plant in Maryland, where we have constructed what we believe to be an excellent, if not state of the art, comprehensive air quality control system.

BACKGROUND

Our Brandon Shores power plant is located on a 375 acre tract along the western shore of the Patapsco River ten miles southeast of Baltimore. Unit one went into commercial service May 15, 1984; Unit two began commercial operation May 28, 1991. The plant has two 640 net megawatt pulverized coal units; a highly efficient turbine, and a central control room for the operation and control of both units and the joint Air Quality Control Systems (AQCS).

The plants can accommodate central Appalachian coal, northern Appalachian and foreign coals. The fuel arrives by barge. Fuel consumption is approximately 250 tons per hour per unit at full load. We consume approximately 3.5 million tons of coal each year and produce 6 to 8.5 million megawatts each year.

The plant was designed with closed-cycle cooling towers and the make-up water for the cooling towers is supplied from pumps with in-take suction from the discharge canal from the adjacent H.A. Wagner power plants, which are part of the overall power generation facility covered under the same Title 5 permit as the Brandon Shores units. Brandon Shores has hot side electrostatic precipitators (ESP) that remove over 99 percent of the particulates contained in the resulting flue gas, low NOx burners with over-fired air, and Selective Catalytic Reduction (SCRs) equipment for NOx reduction; achieving a 90 percent reduction in NOx. Sedimentation and erosion control ponds minimize stormwater run-off. These important environmental features were installed as part of the plant long prior to the commencement of recently completed AQCS. Similarly, we employ an Environmental Management System (EMS) throughout the facility in keeping with the ISO 14001 and our own even more comprehensive environmental policy standards.

Through an innovative partnership with Separation Technologies, Incorporated (STI) and their on-site facility, we beneficially re-use 85 percent of the coal combustion fly ash in concrete.

In short, Brandon Shores was a highly efficient, well functioning, environmentally sound electric generation source before the State of Maryland passed its "Healthy Air Act" on April 6, 2006. Working with the Maryland Department of the Environment, Brandon Shores now meets

all the requirements of that law, which are perhaps the most stringent, and most plant-specific, requirements in the country.

In 2006, the Maryland Healthy Air Act targeted seven Maryland coal-fired power plants for significant emission reductions. The law aimed to reduce nitrogen oxide emissions by about 70 and 75 percent by 2009 and 2012 respectively. It aimed to reduce sulfur dioxide by about 80 and then to 85 percent by 2010 and 2013 respectively. It aimed to reduce mercury emissions by 80 percent and 90 percent by 2010 and 2013 respectively from a 2002 baseline. It also required that the State join the Northeast Regional Greenhouse Gas Initiative (RGGI), which will not be the focus of my remarks today other than to say that since this carbon dioxide-focused program is market based, it required no capital investment.

To accomplish these further reductions, Constellation constructed an additional even more comprehensive Air Quality Control System (AQCS) at the Brandon Shores plant, consisting mainly of a Flue Gas Desulfurization system – commonly called a wet scrubber, plus a Pulse Jet Fabric Filter – commonly called a bag house – with sorbent injection. I will describe these and other elements of the AQCS in a bit more detail below.

The new scrubber installation and other environmental controls have the capability to remove at least 95 percent of existing sulfur dioxide emissions, and reduce 90 percent of existing mercury emissions from the plant. The already-installed NOx controls (primarily the SCR and low NOx burners) limited NOx emissions by 90 percent.

A wet scrubber adds wet limestone into the gas stream emitted from a power plant. The limestone slurry reacts with and captures sulfur dioxide in the gas stream. The resulting by-product can be used to create gypsum board, thereby virtually removing the sulfur dioxide from the generation process. We are also exploring exciting potential applications of gypsum in agricultural settings where it appears it may have significant filtration capability and could be used to reduce nutrient loading to the Chesapeake Bay.

Construction of this scrubber entailed building a new, single 400-foot emissions stack with two flues, and capping the two existing stacks so that all flue gas must exit through the scrubber. The new stack emits visible water vapor, a result of steam in the exhaust flue gas, the by-product of the emissions “scrubbing” process. We constructed hydrated lime and powder

activated carbon (PAC) injection systems for sulfuric acid mist and mercury removal. One of the really unique features of our Scrubber project is the use of “brown water” from the neighboring Cox Creek municipal waste water treatment plant. While this capability meant a little variance from typical design, the economic and environmental benefits made sense. The tie to the treatment plant was one of several new water processing and water treatment facility projects undertaken. In addition, many hundreds of feet of new air ductwork was built and connected to massive fans, pumps and motors.

Groundbreaking for the construction phase of the project began in June 2007. Construction was completed in September of 2009 – approximately 26 months. Constellation began studies and conceptualization of this project prior to the passage of the Healthy Air Act, as we anticipated the likelihood of stricter federal air pollution standards; but actual engineering, design, contracting, procurement, planning and layout commenced while the regulations were being finalized with MDE.

The Unit One AQCS was in service in November 2009; and Unit Two was in service February 2010. The total cost was approximately \$885 million. Constellation has spent more than \$1 billion in air pollution control equipment for our portfolio of plants in Maryland.

At peak construction, 1,385 personnel were employed on site. These were skilled craft and construction workers including boilermakers, steamfitters, pipefitters, operating engineers, millwrights, ironworkers, electricians and master electricians, as well as carpenters, teamsters, and laborers. We worked closely with the Maryland and DC building trades and other unions to accomplish this job in good time and with an outstanding safety performance.

Over the course of the 26 month construction phase, we used approximately 4.3 million man hours to build the AQCS. Using 220 hours per month, 20 days per month, at 11 hours per day, this roughly equates to 1600 job years. These are the hours worked by the contract employees who built the project. It does not reflect the manufacturing jobs associated with the technologies and equipment that our team assembled. The manufacturers of the cranes and vehicles deployed on site, and the manufacturers of the many large and small components ranging from booster fans, pumps and pump motors, to ball mills, electronics, wiring, steel, concrete, and specialty tiles for the flue gas stack, employed many thousands of individuals to

make these goods and operate the companies that form the supply chain for this kind of infrastructure.

Combined with the men and women who operate our power plants, and the linemen, the engineers, the customer care and service representatives, and the internal teams who support these skilled individuals – we create the jobs that are the backbone of the “The Grid.” And, indeed, these are the jobs and careers that help form the backbone of the American economy.

It is this experience – and the empirical evidence of man-hours hired and paid, emissions measured and lowered, megawatts successfully produced and bid into the markets – that give us the confidence that we and our sister companies in the electric power industry can continue to deliver affordable electricity with the great reliability all consumers depend upon, while also meeting the air quality requirements set forth in the Clean Air Act.

Thank you for your time and attention.

Senator CARPER. Thank you very much for that testimony and I look forward to asking you some questions.

Mr. Montgomery, you are No. 4, actually our clean-up hitter. Go ahead.

**STATEMENT OF W. DAVID MONTGOMERY, PH.D., VICE
PRESIDENT, CHARLES RIVER ASSOCIATES**

Mr. MONTGOMERY. Thank you, Mr. Chairman and Senator Johanns.

I would like to provide some perspectives on jobs by focusing on the macroeconomic impacts that were described in EPA's second prospective cost-benefit analysis that was just released a few days ago.

To me, the most important point is that EPA's macroeconomic study directly contradicts claims that are being made about green jobs. The relevant scenario of the EPA study unambiguously finds that increased spending on pollution controls will have overall negative economic effects. If EPA had reported its model results for labor markets, I am confident that this scenario would also have revealed lower wages and lower total worker compensation.

My first recommendation would be that Congress instruct the EPA to provide it with these model outputs to see what its analysis actually has to say about wages and jobs.

The green jobs studies and the other witnesses today have described the jobs associated with making and using pollution controls. I have a quarrel with how they have described that.

The EPA macroeconomic model asks the logical next question, the right question, which is what the workers filling these jobs would have been doing otherwise. EPA's analysis finds that they would have been producing, in productive jobs producing other goods and services so that, on balance, the Clean Air Act regulations, by directing them into producing pollution control, lowered GDP from what it would otherwise be and lowered real income for U.S. consumers.

EPA then creates another case in which it actually adds more workers based on its, actually the other parts of an analysis of health effects, and destroys jobs in the healthcare industry and, in this scenario, it finds because of the increased labor force that there is an increase in GDP and an increase in employment, but it is not because of creating job opportunities, it is because of putting more healthy people in the economy who find jobs doing the normal productive kind of activity.

The third point I would make is that it should be obvious that the EPA study provides no information about the likely costs of new regulations, be it mercury MACT or greenhouse gases. No matter what it says, no study of past regulations can logically be used to justify new ones.

It has also been suggested that environmental regulations will enlarge the U.S. pollution control industry. There is nothing in the EPA study to support this. I suggest that if Congress wants an industrial policy, EPA is not the agency that is capable of creating it.

EPA regulations create a demand for such equipment, but they make it less likely that it will be made in the United States. There

is a global market for pollution controls. Lots of other countries are expecting exactly the same thing, that they will create pollution control industries that will be exporting their goods. Countries like China can offer the materials and equipment much more cheaply because they are free of the costs of U.S. regulation. EPA cannot prevent this with the kind of border measures that were included in last year's cap and trade legislation.

Finally, I would suggest that 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. As far as greenhouse gases go, the virtually unanimous opinion of economists is that regulating greenhouse gases with Clean Air Act tools will not be cost effective, and I will return to that at the end.

I have not found many areas in the macroeconomic analysis in EPA's report that cannot be traced back to its input assumptions about direct costs and benefits. I think the most important is that, for the past several years, EPA has consistently failed to provide a satisfactory account of how particulate matter and ozone are causally related to mortality. I think this puts in question its calculated mortality reductions that provide over 93 percent of its direct benefits in 2010. Without these assumptions about health benefits, the macroeconomic benefits, even in its cost in health case, go away.

There are several other methodologies that I think need to be reviewed critically, including those that EPA used to estimate other benefits, other air quality benefits, a systematic bias downward in its cost calculations, and a flaw in the macroeconomic modeling, I think, makes it estimated unreasonable economic gain for the petroleum industry.

I believe that if the cost-benefit analysis were redone to address these biases in the costs and benefits, it would probably come out showing that the costs and benefits are of about the same scale. This suggests that it is very important to break out, as EPA was instructed to do, the costs and benefits of the individual programs in order to see which are providing a positive cost-benefit effect and which a negative cost-benefit effect. That is really important for thinking about future regulations and where future regulation can provide economic benefits and where it is not likely.

So, let me just end quickly, I know I am out of time, on greenhouse gases.

I believe, and so do many other economists, that imposing, that using the Clean Air Act toolkit to regulate greenhouse gases would impose unnecessary costs and would have next to no health benefits for the United States.

Before I am accused of ignoring the science, I believe it is mainstream science to admit that greenhouse gases are different from other criteria pollutants and the United States can have only a negligible impact on the global effects, and, therefore, can only have negligible health benefits for the United States.

These are the kinds of problems that can only be fixed by Congress. Congress can get us off the road toward ineffective and thus unnecessary regulations by removing greenhouse gases from the Clean Air Act and adopting a uniform no exceptions carbon tax with 100 percent of the revenues returned to the people. I would

encourage you to think about this because the optimal policy is really quite simple and abundantly clear.

Thank you.

[The prepared statement of Mr. Montgomery follows:]

Prepared Testimony of
W. David Montgomery, Ph.D.
before the
Subcommittee on Clean Air and Nuclear Safety and
Subcommittee on Green Jobs and the New Economy
Committee on Environment and Public Works
United States Senate
Hearing on Clean Air Act and Jobs
March 17, 2011

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 I – 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.

Senator CARPER. Mr. Montgomery, thank you for your testimony. Mr. Yann.

**STATEMENT OF JAMES A. YANN, MANAGING DIRECTOR,
ALSTOM POWER**

Mr. YANN. Good morning. I would like to thank Chairman Carper and Chairman Sanders for this opportunity to address the potential for job creation under the current proposed regulatory regime set forth by the U.S. Environmental Protection Agency under the Clean Air Act.

Alstom is a global leader in the power generation, rail transportation infrastructure and power transmission and distribution industries. Our company sets the bench mark for innovative and environmentally friendly technologies. Today, Alstom equipment can be found in more than 50 percent of U.S. powerplants, while globally it generates more than 25 percent of the world's electricity. Alstom is also the world's largest air pollution control company.

Alstom employs more than 93,000 people in 70 countries and had sales of approximately \$30 billion in 2009–2010. In the United States, Alstom employs about 6,000 full-time permanent employees in 47 States and the District of Columbia. This number can nearly double when accounting for workers hired for civic projects.

Alstom continues to grow and invest in the United States. Last year, we inaugurated a \$350 million steam facility in Chattanooga, TN, and this summer we are opening a new wind turbine manufacturing facility in Amarillo, TX.

We are here today to specifically address the subject of potential job creation in the air pollution control industry, its supply chain under the current rules affecting the industry, most notably the Clean Air Transport Act and other rules referred to as HAPs MACTs.

The actual amount of equipment to be installed is a complex question which depends on the timing of each of the rules, including possible greenhouse gas regulation, as well as fuel availability, pricing and many other factors. We leave it to others to explore and finalize the application of these factors.

However, leveraging our knowledge of typical air pollution control projects applying a range of technologies and estimates provided by industry experts, we can offer insight into the typical employment requirements for a nominal 500 to 600 megawatt unit.

Let us start with wet flue gas desulfurization, or scrubbers as they are commonly called. A standard scrubber project will require in excess of 50,000 engineering, procurement, project management and support hours, which may increase as much as 50 percent including hours for the owner and the owner's engineer.

The typical scrubber is field erected and requires more than 2,000 tons of fabricated steel delivered to the site. This steel represents more than 40,000 man hours of production. The largest single source of manpower is the actual erection of the scrubber, which requires a wide variety of trade crafts. This typically lasts over 30 months and employs some 700 craft people on average during that period.

Scrubbers consist of a large number of components including pumps, demisters, spray nozzles, electrical equipment, wiring, con-

trols, emission monitors, crushers/ball mills, conveyors, weighing devices and so on. It should be noted that almost all of this equipment can be procured from sources in the United States.

In total, a wet flue gas desulfurization project will provide the equivalent of about 775 full-time jobs over the three plus years of the project, not including jobs involved in delivery of the materials and equipment to the site. Estimates such as those provided by ICF to the public of some 60 gigawatts of new FGD projects required under its rules could translate into approximately 100 projects over a five to 6 year period, representing 77,000 direct job years.

Based on studies by ICF and others, it is anticipated that the nitrogen oxide control market will be less than half the size of the sulfur oxide market. These projects, while less complex from a process point of view, can be more complex from an installation view. Following similar logic to that above, it is anticipated that work with nitrogen oxide control projects would result in about 35,000 to 40,000 job years over the same period.

Since the HAPs MACT was released yesterday, we have not had time to adequately determine actual requirements. It is our general belief that some number of fabric filters will be required. Given the diverse offerings for collection of mercury and other metals, the number of fabric filters required may be in the range of 70 gigawatts. Applying the same job creation logic, this could spur the creation of approximately 50,000 job years over the same five to 6 year period.

The last area which will create jobs is the supply of reagents to these systems. These include ammonia, lime, limestone and activated carbon, among others. It is estimated by the Institute of Clean Air Companies that this market will increase by about \$400 million annually to support the operation of the equipment installed.

In summary, it is expected that these regulations will create the opportunity to create more than 150,000 job years over a span of five to 6 years for implementation alone. This does not include jobs created by sub-suppliers of components, transportation, commodities, suppliers and the indirect multiplier that is normally associated with supporting direct jobs. Estimates of industry associations put the total market in the range of \$4 billion annually until compliance.

We would like to thank the two subcommittees for this opportunity to provide this information.

[The prepared statement of Mr. Yann follows:]

Testimony of James Yann
Before the U.S. Senate Committee on Environment and Public Works
Subcommittees on Clean air and Jobs
March 17, 2011

Good morning. My name is James Yann, and I am Managing Director for the North American Environmental Control Systems business of Alstom Power. I would like to thank Chairman Carper, Chairman Sanders, Ranking Member Barrasso, and Ranking Member Boozman for this opportunity to address the potential for job creation under the current and proposed regulatory regime set forth by the U.S. Environmental Protection Agency under the Clean Air Act.

Alstom is a global leader in the power generation, rail transportation infrastructure and power transmission and distribution industries. Our company sets the bench mark for innovative and environmentally friendly technologies. Today, Alstom equipment can be found in more than 50% of U.S. power plants, while globally it generates more than 25% of the world's electricity. Alstom also is the world's largest air pollution control company.

Alstom employs more than 93,000 people in 70 countries and had sales of approximately \$30 billion in 2009-2010. In the U.S., Alstom employs about 6,000 full time permanent employees in 47 states and the District of Columbia. This number can nearly double when accounting for workers hired for specific projects. Alstom continues to grow and invest in the U.S. Last year, we inaugurated a \$350 million new steam turbine facility in Chattanooga, Tennessee, and this summer we are opening a new wind turbine manufacturing facility in Amarillo, Texas.

Alstom's Environmental Control Systems business (ECS) traces its roots as far back as 1920, when the business made mechanical collectors and fans for removing soot and ash from early power plants and industrial facilities. Today, ECS is a highly innovative environmental company continuing to specialize in air pollution control. We offer a full line of both wet and dry flue gas desulfurization equipment for sulfur oxide control, both combustion and post combustion control of nitrogen oxides, electrostatic precipitators and fabric filters for particulate control, and mercury control through both combustion and post combustion techniques. Our experience includes more than 100 GW of flue gas

desulfurization, more than 350 GW of particulate control, more than 80 GW of nitrogen oxide control and approximately 15 GW of mercury control.

Additionally, Alstom is a leader in developing carbon capture technologies to lower CO₂ emissions. Alstom is commercializing three CCS technologies: oxy-firing combustion, Chilled Ammonia and Advanced Amine for post-combustion control. Currently, Alstom has 12 CCS projects in the operation, construction, or engineering stages around the world. These range from small pilot plants up to 250 MW commercial size plants.

We are here today to specifically address the subject of potential job creation in the air pollution control industry, and its supply chain, under the current rules affecting the industry – most notably the Clean Air Transport Rule and other rules referred to as the HAPs MACTs. The actual amount of equipment to be installed is a complex question which depends on the timing of each of the rules, including possible Greenhouse gas regulation, as well as fuel availability and pricing, and many other factors. We leave it to others to explore and finalize the application of those factors.

However, leveraging our knowledge of typical air pollution control projects applying a range of technologies, and estimates provided by industry experts, we can offer insight into the typical employment requirements for a nominal 500-600 MW unit.

Let us start with wet flue gas desulfurization, or scrubbers as they are commonly called. These projects typically have a duration of 28-40 months and begin with engineering and design work. A standard scrubber project will require in excess of 50,000 engineering, procurement, project management and support hours, which may increase as much as 50% including hours for the owner and the owner's engineer. The typical scrubber is field erected and requires more than 2,000 tons of fabricated steel delivered to the site. This steel represents more than 40,000 man-hours of production. The largest single source of man power is the actual erection of the scrubber, which requires a wide variety of trade crafts. Typically this lasts over about thirty months and employs some 700 craft people on average during that period. Scrubbers consist of a large number of components including pumps, demisters, spray nozzles, electrical equipment and wiring, controls, emission monitors, crushers/ball mills, conveyors, weighing devices and so on. As we tie these complex projects back to potential job creation, it should be noted that almost all of this equipment can be procured from sources in the United States.

In total, a wet flue gas desulfurization project will provide the equivalent of about 775 full time jobs over the three plus years of the project, not including jobs provided for all the equipment suppliers and delivery services involved in delivering materials and equipment to the site. Estimates such as those provided by ICF to the public of some 60 GW of new FGD projects required under the aforementioned rules, could translate into approximately 100 projects over a five to six year period, thus representing approximately 77,000 direct job-years .

Based on studies by ICF and others, it is anticipated that the nitrogen oxide control market will be less than half the size of the sulfur oxide market. These projects, while less complex from a process point of view, can be far more complex from a construction perspective because the selective catalytic reduction equipment must be installed between the boiler and the existing particulate collection equipment. Sulfur oxide scrubbers on the other hand are installed at the end of the process train. Following similar logic to that above, and again drawing from ICF estimates, it is anticipated that work on nitrogen oxide control projects would result in about 35-40,000 job-years over the same time period.

Since the HAPs MACT has not yet been released, it difficult to anticipate the actual requirements. It is our general belief that some number of fabric filters will be required on those plants that do not have oversized electrostatic precipitators, can not install a hybrid ESP/FF, or do not already have fabric filters (where a fabric media change may prove to be adequate). Similarly, given the diverse offerings for collection of mercury and other metals, the number of fabric filters required may be in the range 70 GW. Applying the same job creation logic, this could spur the creation of approximately 50,000 jobs years over the same 5-6 year period.

Additional considerations also offer paths to job creation.. Operators and maintenance personnel will be hired in the plants that may range from as few 10 to as many as 30 per plant depending on operation and maintenance philosophy at each installation. Assuming this affects approximately 100 plants (many plants already have some of the equipment described), this represents an additional 1,000-3,000 full time jobs.

The last area which will create jobs is the supply of reagents to these systems. These include ammonia, lime, limestone and activated carbon (ACI), among others. It is estimated by the Institute of Clean Air Companies that this market will increase by about \$400,000,000 annually to support the operation of the equipment installed as a result of the regulations listed above.

We wish to make it clear that while we are confident in the estimates of effort required for each project, any projections on total job creation is dependent on the number of units installed. For purposes of this recitation, we have leaned heavily on others to interpret the impact of the regulations.

In summary, it is expected that these regulations will create the opportunity to create more than 150,000 job-years over the span of 5-6 years for implementation alone. This does not including jobs created by sub-suppliers of components, transportation, commodity suppliers, and the indirect multiplier that normally is associated with supporting direct jobs. Estimates of industry associations put this total market in the range of \$4 billion dollars annually until compliance (not including operations and commodities).

While Alstom is working to develop innovative technologies for meeting the potential requirements of any Greenhouse Gas regulations that may be proposed, we have chosen not to address them at this time except to say that such control systems will be much larger and more complex than the processes discussed above. Therefore, they also will have the potential to create far more jobs than the regulations we have addressed today.

We would like to thank the two sub-committees for the opportunity to provide this information.

Senator CARPER. Mr. Yann, thank you so much for wrapping us up here.

Good testimony and enlightening testimony and, in some cases, the testimony, I almost wish we could let the witnesses ask questions of one another. We ought to find a way to do that.

Let me just start off by saying that Delaware is, it does not include, in our State, we do not include the Chesapeake Bay. But tributaries from Delaware, including Nanticoke River, actually lead to the Delaware Bay, excuse me, to the Chesapeake Bay. As it turns out, there are tributaries from maybe half a dozen or so States that actually, whose waters end up in the Chesapeake Bay.

The Chesapeake Bay has been struggling for a long time with sedimentation, all kinds of nutrients and so forth that have led to, that are killing parts of, vast parts of the Chesapeake Bay. There is just not much going on there in terms of life.

The folks in the Chesapeake who make their living off of, as watermen, do not much like this. They have called on their elected officials to work on the rest of us to try to clean up our runoff so that they will have, actually, a Chesapeake Bay that will be alive and vibrant and provide livelihood for them.

There are a couple of rivers that flow into my State from Pennsylvania. We use those rivers for, the water, when it gets to Delaware we use it for drinking water. We treat it, but use it for drinking water. There is a great concern about what the folks who live upstate from us in Pennsylvania are putting into what ultimately becomes our drinking water.

In our Dover, DE, we end up breathing the air that brings with it pollution from Dover, OH. It brings pollution from Tennessee and Indiana, West Virginia, Virginia, and we end up having to breathe that stuff. We end up having to reduce our emissions in order to try to be in compliance with Federal environmental guidelines. We end up having to put extra pollution devices on our own utilities in order to reduce emissions. A lot of the stuff that we are breathing here comes from outside of our State.

Jim Inhofe and I spend about a half an hour together every Thursday in the Capitol in a bible study group that is led by our Chaplain, Barry Black, who is a retired Navy Admiral, a good guy. He is always reminding us to one, try to ask, how does your faith guide you in what you do? The other thing, he is a big, as Jim knows, Chaplain Black is a big believer in the Golden Rule. Treat other people the way we want to be treated. He likes to say the Golden Rule is the CliffNotes of the New Testament.

I just want to ask you, in thinking of those example, our waters contributing to the pollution problems that they have in the Chesapeake, upstream water pollution that comes down and we end up having it in our drinking water, and the air that we breathe in Dover that is polluted by places as far away as Dover, OH and further west than that.

How does that, how is that consistent with the Golden Rule? Mayor?

Mr. HOMRIGHAUSEN. Well, in Dover's example, we have always had a strong commitment to being good stewards of the environment. We were the first municipal electric system in the United States to install gas-fired co-burners to clean up our emissions on

startup when we fire up the coal. We also have the ability to co-fire with gas. With the price of gas, we do not do that. We have switched to a different coal that allows us to burn cleaner.

We have installed a \$6.15 million bag house which I do not think we bought from Alstom. But our opacity is next to nil. We have a very clean operation. We do what we can to do our part to clean up the environment and that has always been our commitment ever since I have been Mayor since 1992. We do it consistently. We are always looking at ways to clean up any problem areas that we might have.

So, I understand that you are getting some kind of transport from other areas of the country but I would doubt very much that it is coming from Dover, OH.

Senator CARPER. Well, I hope not. We compete for jobs. We have a former Mayor up here and a couple of recovering Governors and we compete for jobs every day against other States and against the rest of the world.

Among the two driving factors for creating a nurturing environment for job creation and job preservation, one of them is the cost of power, the cost of electricity, and the other is the cost of healthcare. I would just suggest to you that when we are trying to compete with States that get much cheaper utility costs because they burn dirty fuels and create pollution for us, and we have to increase our utility costs in part to try to control emissions, and then we end up paying higher healthcare costs. It is just not fair. It is just not fair.

I would just ask you to keep that, when the folks in Dover, OH are thinking about your pollution and what to do in terms of reducing your emissions, I hope you will keep in mind that there are folks in other Dovers that end up having to breathe the stuff, end up having to pay higher healthcare costs. We have thousands of kids that are not in school today because of the asthma, because they cannot breathe the air, and it is just not fair. I would just ask you to keep that in mind.

The great thing about this situation we are in is that it actually can create jobs. Mr. Montgomery, you seemed to suggest it does not. Maybe these folks are working on air pollution control devices and installing them in places across the country, but they could find other work. The unemployment rate in the construction industry is 21 percent today. The folks that are doing the work that helps reduce these emissions, they are going to say, well, we are not going to reduce SO_x, NO_x and mercury emissions today, we want you to go and find other work, you would be gainfully employed.

The unemployment rate is over 20 percent and it might be easy to sit here today in Washington, DC. in this hearing and say, well, they could find work someplace else. Well, if they could find work someplace else, I suspect they would be doing it.

I will come back to, if I can, to Ms. Somson. I was very much involved in the CAFE legislation, trying to come up with something that the auto industry could live with and that was fair to the rest of us as well.

Talk to us, if you will, and in CAFE we basically came to a bipartisan agreement. Ted Stevens, remember Ted Stevens? A big player

in all of this for us at the end in getting us to a situation where in CAFE 2007 we said by 2020 overall fleet average energy efficiency, fuel efficiency, will be 36 miles per gallon.

We still had a problem, though, because there was a question of are we going to have a California standard? Are we going to have separate standards for different States? The current Administration got involved and said, let us just try to not have a bunch of different standards, let us just have one standard, 36 miles per gallon, we are going to have it by 2016.

The auto industry bought in, UAW bought in. Just talk to us about why that makes sense, why that is a good idea.

Ms. SOMSON. Well, thank you for giving me that opportunity and I will point out that under the EPA NHTSA One National Program that runs from 2012 to 2016 we will be at 35.5 miles per gallon by 2016. So, we moved that up considerably.

The auto industry is one where planning has to be done years and years in advance and the investments are enormous capital investments. They need the certainty of what is going to be demanded of them in order to develop, to do the research and development, to do the retooling of the facilities, to train workers, to get the equipment. They need that years out. Five years, which is the authority that NHTSA has, is actually not even an ideal time for how long ahead we have to be planning.

We definitely need one national standard and not a patchwork of different regulations for different parts of the country. It would be way too difficult to be manufacturing and selling and keeping track of things in different States.

But if I can take this opportunity to just play off a little on what Mr. Montgomery said. I am not an economist and I am not going to speak to job growth, green jobs in other parts of the economy. But the job growth that we have seen here that I testified to here today, these are jobs that would not be in this country otherwise.

Up until a year ago, there was really only one facility in the United States that was making the components for advanced technology vehicles and that was the White Marsh facility in Maryland and it was making them for trucks. So, the advanced vehicles, the vehicles of the future and their components, were all being imported. Priuses are imported. All of the engines and the power trains for the high-tech vehicles that are assembled here in the United States, all of them were being imported from Japan or Italy or Germany.

We are now seeing, because of some of the things I testified about, the growth of these 30 new plants. We will actually be able to make the components, not just assemble from parts that are coming in from outside the United States. But these are truly new jobs because of the requirements that the industry knows they have to meet because of the one national standard.

Senator CARPER. Thank you very much. We have been joined by Senator Barrasso. Jim, our friend from Nebraska has not had a chance to say anything today. Should we go to him first? What do you think?

Senator INHOFE. [Remarks off microphone.]

Senator CARPER. All right. Senator Johanns, please proceed.

Senator JOHANNIS. Very, very nice of you, but go ahead. I am ready to do questioning when it gets to be my turn. You are always the gentleman, Mr. Chairman, and I thank you for offering me that courtesy, but let us just keep on going.

Senator CARPER. Fair enough. All right. Jim, who should we go to next? Do you want to go to Senator Barrasso? What do you think?

Senator INHOFE. You are the Chairman.

Senator CARPER. All right. John, when you are ready.

Senator BARRASSO. Can we just do questions as well or can we do opening statements?

Senator CARPER. Well, you can do either one.

Senator BARRASSO. But you have been asking questions?

Senator CARPER. Well, we have done opening statements and now we are doing questions.

Senator BARRASSO. All right. Thank you very much, Mr. Chairman, and I appreciate this.

I want to welcome all of the witnesses, including the Mayor of Dover, OH. I think you offered a great amount in your testimony. I have had a chance to review it in advance.

We are here to talk about the claims of jobs growth that are going to come from massive Government regulations. The theory goes that by crushing red, white and blue jobs through the EPA regulatory meat grinder that that will actually in some way churn out green jobs. I just do not believe that.

In yesterday's *Wall Street Journal* there is an article entitled, Food Stamps Surge in the West. The article talks about how, before the recession hit, Idaho and Nevada and Utah had some of the lowest rates of food stamp use in the Nation. It was a boom time in that region, and it is a region that has always prided itself on self-reliance and a disdain for Government handouts.

But since the recession hit, these three States have the fastest growth rates in the Nation of participation in the Federal programs. My concern is that with additional rules and regulations that are in this region, with the EPA regulatory train wreck of regulations, that this is going to increase and continue to be a problem.

When these EPA regulations hit, some of which came out yesterday, coal-fired powerplants are either going to close or make costly upgrades and pass those costs on to consumers. *The New York Times*, *Wall Street Journal* and *Washington Post* today all report that the cost to consumers is going to be anywhere between \$40 and \$50 a year in increased electricity costs only related to that one regulation that came out yesterday. Now is the time that people are having to deal with paying at the pump, which is a significant impact on the quality of life of families all across this country.

Last year around this time the Director of GE's Smart Grid, I am sorry, the former Director of GE's Smart Grid Initiative, wrote an editorial in the *Washington Post* entitled The Green Jobs Myth. In it, this individual states that a clean energy economy will not offer a panacea, but those who take great pains to tout the job creation potential of the green space might just end up including labor pains all around.

So, Mr. Mayor, I appreciate your being here. I know that you stated in your testimony that the benefit of having and maintaining local generation comes with significant costs and particularly compliance costs related to the ever increasing array of environmental regulations on our fossil fuels.

You stated that these regulations would lead to direct job losses at your powerplant and I would just ask if you could explain that in terms of how these jobs would be lost.

Mr. HOMRIGHAUSEN. Well, Senator, if we are forced to go out of the coal business in generation, all of the 30 some jobs that we have at the powerplant would no longer be needed. We would go away from the boiler operators and the dispatchers to just maintaining the inflow of electricity from our inner connections with the EP and then the outflow going to our distribution system. So, we would lose the majority of those jobs in the powerplant, and all of the associated—

Senator BARRASSO. I was going to ask you about the associated jobs.

Mr. HOMRIGHAUSEN. The associated jobs, from the coal suppliers, if you look at it, one calculation it would have a 52.5 job impact on just the city of Dover.

Senator BARRASSO. Those jobs, would you consider them good paying jobs with benefits?

Mr. HOMRIGHAUSEN. The lowest paid powerplant worker is, I believe, \$23 with about 44 percent benefits.

Senator BARRASSO. Are they going to be able to go right to green jobs at that same kind of pay?

Mr. HOMRIGHAUSEN. Not in Dover.

Senator BARRASSO. Thank you.

One of the things you stated in your testimony was that the EPA's rulemaking can put us in an untenable position of deciding to either spend millions of dollars on the plant upgrades necessary to assure compliance or to deal with these issues. The money that you will have to spend to comply with the EPA's what I call train wreck of regulations, you know, where would that money go if you would not have to do and make those expensive changes?

Mr. HOMRIGHAUSEN. Well, that money could be spent on infrastructure for roads, water, wastewater, all of the city services that we provide, rather than spending additional moneys on compliance measures when Dover has stepped to the plate consistently and spent money on pollution controls that some of other municipal electric companies in the State have not done.

We were the first ones, as I mentioned earlier, to put in gas burners to help with our generation. We also put in the bag house that nobody else has put in. So, we are doing our part to clean up. Who knows what is going to be coming down the pike later.

Senator BARRASSO. Yes. Thank you very much, Mr. Mayor.

Ms. Somson, I had a question for you. There was a *Wall Street Journal* article, a front page article, on Monday, March 14th. It was an article entitled, EPA Tangles with New Critic Labor. I know that you are representing the United Auto Workers here today. It said several unions with strong influence in key States are demanding that the Environmental Protection Agency soften

new regulations aimed at pollution associated with coal-fired powerplants.

It goes on to say that their contention, roughly half a dozen rules expected to roll out within the next 2 years could put thousands of jobs in jeopardy and damage the party's, the Democratic Party's, 2012 election prospects.

In fact, the article references a miner's union study that says as many as 250,000 union jobs are at risk. The article says many of these jobs are in the utility, mining and railroad sectors and it says the heaviest impact will fall on rust belt States that have many old coal-fired plants as well as electoral votes. They talk about Ohio, particularly.

So, in spite of your testimony, is it fair to say that unions are split on the issue of the job creating ability of regulations from the Clean Air Act?

Ms. SOMSON. I think that there are, it is true that unions do not speak with one voice. I read that article. I know the mine workers have very justifiable concerns about how regulation would affect their industry. That does not mean that they are opposed to regulation. They just want to make sure that it is done right. I think that is also true for the transit unions that transport the coal.

But I will note that there was at least one union that was mentioned in that article, the steelworkers, that is a part of a coalition that the UAW is also a part of called the Blue Green Alliance, which is environmental groups and unions trying to work together to see how we can do this in a way that is both good for the environment and good for jobs.

The steelworkers did sign on to a statement that was put out by the Blue Green Alliance yesterday saying that we think we can get there, that we have to do it very thoughtfully, we have to be mindful of the impact on jobs for some sectors of the labor movement, but that working together and working carefully and taking everybody's view into consideration, we can get there. We do not have to fail to regulate because of those concerns.

Senator BARRASSO. But you are not disputing the figure by the miner's union study that says as many as a quarter million union jobs are at risk?

Ms. SOMSON. I am not in a position to really—

Senator BARRASSO. Thank you.

Thank you, Mr. Chairman. I appreciate it.

Senator CARPER. Senator Inhofe, would you mind questioning now?

Senator INHOFE. Would I mind? I do not mind at all.

Senator CARPER. Go ahead. Thanks for your patience.

Senator INHOFE. Since we are joined by both Senator Johanns and Senator Barrasso, I think it is worthwhile mentioning two other very significant pieces of legislation that have to do with the subject we are talking about.

Senator Barrasso goes beyond my bill that I referred to in my opening statement having to do with the EPA's regulations of greenhouse gases and he gets into all kinds of areas affecting the Endangered Species Act, the various MACTs that are out there, and I have joined him on these.

Of course Senator Johanns I mentioned in my opening statement. I have joined him on his bill that is going to require the EPA or a new commission made up of the Secretaries of Energy, I guess the five or six Secretaries already existing, as to what the cumulative effect is. Because we have been trying to get this from the Environmental Protection Agency for literally months because we have different amounts that come with each new regulation.

Now, as far as the one that concerns me the most, and this is very timely because it is in the regular order on the floor of the Senate today, it is right now pending, and that is my bill that I refer to as the Inhofe-Upton Bill, and Upton refers to it as the Upton-Inhofe Bill, we have talked about that before, that would take away the jurisdiction of the Environmental Protection Agency in the regulation of greenhouse gases.

I start off, in your opening statement, Mayor Homrighausen, you made the statement that you felt that the EPA was not equipped to regulate greenhouse gases. Would you like to elaborate anything on that statement?

Mr. HOMRIGHAUSEN. Yes, Senator. The process that has been touted for many years is to inject the gases into the ground and that really has not been perfected. AEP in Ohio has been doing a study project along the Ohio River. That has not been perfected. We just, there is a lot of uncertainty as to what you do with this, the greenhouse gases. What happens when it gets in the ground and will it affect our water supply? So many unanswered questions that I do not feel we are ready to go forward with that type of process without the questions being answered.

Senator INHOFE. Well, what do you think, well, let me just go ahead. Dr. Montgomery, do you have any comment to make about that in terms of the capability to regulate greenhouse gases within the Environmental Protection Agency under the Clean Air Act?

Mr. MONTGOMERY. Yes, Senator, thank you for asking.

I think the Clean Air Act toolkit is entirely inappropriate for greenhouse gas emissions. Greenhouse gases are a global problem, they are a problem which the United States can only have a minuscule effect on through actions that we take within our own borders. It is the perfect example, Senator Carper, of the Golden Rule that we, that by the time it really matters, most of the greenhouse gas emissions that effect us are going to be coming from countries like China. So, that is on, kind of, the benefit side.

On the cost side, EPA has a very limited toolkit. Achieving the kind of emission reductions that were described last year in climate legislation as being required to put the world on a path toward stabilizing concentrations at levels that the international negotiations aimed for requires massive changes in our energy sector. They require changes in the decisions that just about every business and industry would be undertaking. The only way to mobilize that kind of a change is through a consistent and broad economic incentive.

Bureaucrats in Washington or even in the EPA regions cannot know enough about the individual decisions that every business and household faces to get at them in any way that is not grossly intrusive and grossly inefficient.

The tools in the EPA toolkit are so limited that what they do is produce highly burdensome regulations in the particular areas that

EPA can work with and do nothing in other areas so they add up to a grossly ineffective, I mean, one set of calculations I saw that MIT has done recently suggests that a regulatory approach to regulating greenhouse gas emissions would cost six times as much as the cap and trade approach that Congress has already rejected.

Senator INHOFE. Yes, that is very significant, and I have documentation that it would be more. I have been using, and I used it on the floor yesterday, in talking about the cost of the EPA regulating greenhouse gases to the manufacturing sector, the power sector, and everybody else, I have continued to use what we originally got from the Kyoto Treaty.

Now, granted that was a long time ago. But then each year after that, we failed, I might add that President Clinton never did submit that for ratification, but each year after that we had various cap and trade bills, in 2003, 2005, 2007 and then, most recently, the Waxman-Markey. In each case, we updated the cost. Originally it was, the Wharton School and MIT came out, along with CRA and others, and analyzed how much it would cost. It has actually remained at least the same by all analyses.

Now, here we are in the midst of talking about how much, what we are trying to do to cut down the deficit and the debt, we are coming up with CRs that, we are talking about \$1.4 billion or maybe even \$60 billion, and yet the cost of this would be between \$300 and \$400 billion a year. I know we are just talking about greenhouse gases right now. Again, we have that documented and you just said that by regulation, it would actually be more than if we were to pass legislatively a cap and trade.

Why would it be more by regulation than it would be by cap and trade?

Mr. MONTGOMERY. What a cap and trade system does with all of its potential defects is make sure that if it costs more in one sector to redo the economy, like transportation to reduce emissions by a ton than it does in another sector, like electric power to reduce emissions by a ton, trading can take place between those sectors. The market will adjust to it so that across the board in the economy for everyone who is regulated, the last ton of emission reductions has the same cost.

When EPA exercises its authorities, they are under a set of requirements to apply MACT in one area, to apply BACT in another area, to apply a different set of tools in a third area, to completely ignore 25 other areas. So, you do not come close to equalizing impacts, equalizing the marginal costs across all sectors.

In particular, it grossly overemphasizes very costly reductions in emissions in the transportation sector while leaving aside very much less costs in emissions in other places.

Senator INHOFE. OK. One thing, and I also mentioned this yesterday on the floor of the Senate, is that I was praising the Clean Air Act and the amendments to the Clean Air Act, how successful they have been, how they have reduced pollutants.

It was originally designed, though, to go after what I refer to, and were referred to at that time, as the six real pollutants, and it had nothing to do with CO₂. That has had a remarkable success rate in bringing that down. I always like to say that because I

think it is significant. Regulation of CO₂ is something that is different, however.

Let me ask you, Mayor, one more time, I like to say Mayor because it is too hard to pronounce your name.

[Laughter.]

Senator INHOFE. I mentioned in my opening remarks that I had a hard job once. I was a Mayor, too.

We know, you have talked about Dover. You have, what about the rest of the State? Do you talk to your counterparts, other Mayors? Are you just one, isolated area where unemployment is a problem as a result of some of these over regulations?

Mr. HOMRIGHAUSEN. Well, Dover is on the eastern part of the State where a lot of the auto industry and steel mills were. So, a lot of our unemployment has come from plants being shut down, autoworkers being put out of work. But a lot of my counterparts in the State also experienced a downturn in the economy because of loss of jobs from associated industries that have been affected by the economy.

Now, they do not have some of the problems that Dover has because we are only one of five municipalities in the State that still generates a portion of our electric need. So, the closest to us would be Orrville that also has a coal plant and they experience a lot of the downturn but, in their favor, they also have Schmucker's and Smith Dairy. So, Schmucker's is not going to go away.

Senator INHOFE. Well, OK. Well, let me, I have been waiting for this to show up here. Senator Barrasso was talking about the jobs and about where the unions are in this. I would only mention, and ask if you disagree with this segment of the unions, in terms of the boiler MACT up to 800,000 jobs at risk, opposed by the United Steelworkers Union, the United Steelworkers believes the proposal will be sufficient to imperil the operating status of many industrial plants, in the union's view, tens of thousands of jobs would be imperiled.

The utility MACT, they talk about according to the Unions for Jobs and Environment, the UJE, an umbrella group for labor unions including the Teamsters' Union, United Mine Workers, 16 coal-fired plants in West Virginia, the top coal producing State east of the Mississippi River according to the EIA, 38 in Ohio, 32 in Michigan, 24 in Indiana, 21 in Pennsylvania, 21 in Wisconsin are at risk of shutting down because of the EPA rules.

Now, I could go on and on but I am out of time. But I would only like to ask you, do you disagree with all of these union figures that we have been given by these unions?

Ms. SOMSON. Are you speaking to me?

Senator INHOFE. Yes, of course.

Ms. SOMSON. I cannot speak for other unions. I can refer, and if you like, I could offer to be included in their—

Senator INHOFE. Well, these are other unions. I think they are you, also, they include you, do they not?

Ms. SOMSON. The UAW? I do not think so.

Senator INHOFE. OK, OK, go ahead.

Ms. SOMSON. I heard you mention the steelworkers union, but I am reading from a press release from yesterday made by Leo Girard, the International President of the Steelworkers and a Co-

Founder of the Blue Green Alliance, saying that the United States must be positioned to lead in the global economy of the 21st Century and thoughtful measures to reduce carbon emissions will spur the kind of economic growth needed to put the U.S. economy back on track.

I will include in the record the press release and the two page statement that was made and joined by a number of unions saying that we should be regulating greenhouse gases, it just needs to be done in a very thoughtful way.

But I would also like to add that the jobs that we are seeing, growing, we are regulated. The auto industry's greenhouse gas emissions are already regulated by EPA with NHTSA. We have seen job growth and the majority of that job growth is in States like Ohio, Michigan, Indiana, Illinois. That is the belt where the major components are made.

Senator INHOFE. Right. No, I understand that—

Senator CARPER. Senator, Senator, wait. We are going to have another round. We will have another round.

Senator INHOFE. Well, I will not be here for another round and I wanted to just make sure that I have, in the record, these statements talking about the effects they are having on jobs and how the unions are responding to that.

By the way, it is NHTSA, not the EPA, that is already doing the regulating.

Senator CARPER. The Senator's time has expired. You are welcome to come back for a second round.

Senator INHOFE. Thank you so much.

Senator CARPER. Senator Johanns.

Senator JOHANNNS. Mr. Chairman, thank you.

Let me just offer an observation. You are a good panel. The discussion that has gone back and forth here has been worth everybody's investment of time and we appreciate you being here.

Let me offer a perspective that will lead to a few questions. Soon after I arrived in the Senate a couple of years ago, and I was a Mayor also at one point in a previous life, but soon after I arrived in the Senate the Senate Ag Committee had a hearing on the impact of cap and trade on agricultural. Of course, if you impact agriculture you impact food prices. I guess that is obvious.

Now, I have always maintained that the average citizen feels inflation most in two areas, at the gasoline station and at the grocery store, because the options are so limited. You must eat and you must gas up the pickup or the car to get to work and to get the kids at day care and whatever else is going on.

I will never forget going through this and feeling in my mind how insufficient the study was, how inadequate the analysis had been. I remember in that hearing asking the question, well, how many acres of productive grassland or cropland do you anticipate going from productivity to planting trees? Gosh, they were struggling to answer that.

The Secretary was there, the Secretary of Agriculture, Tom Vilsack, the Administrator, Lisa Jackson, was there, and I never really did get a good answer. Then, many weeks later, it came out that it was 50 to 60 million acres. I mean, it was stunning. Of course, if you take grassland, which we graze cattle on, or produc-

tive cropland out of productivity, it is going to have an impact on prices and therefore an impact on the consumer.

But at the end of kind of all of this I asked the Administrator, Lisa Jackson, a question, and it is on the record somewhere, to the effect of, if we do everything, describe for me the impact. She said, well, there would not be any.

It dawned on me that global warming is called global warming for a purpose. It is not Nebraska warming, or Dover warming. It truly is a global issue that we are trying to come to grips with. I have traveled extensively as a former Secretary of Agriculture to places like China and India and you know, gosh, we could crush our economy, not have any impact.

So, when the witnesses testify about the things that need to be done and yes, maybe jobs are created, but I think of Nucor Steel in Nebraska, they employ 1,000 people, of course they get tangled up in this, those are really high-quality jobs. We will not replace those jobs if they go to China. They just tell me point blank, Mike, our competition is in China. That is who we are competing with.

All I want is an understanding of what is going on here. It is so easy to talk about green jobs, and this is going to happen to our economy, and that is going to happen, I just want solid analysis as to who wins here, because there probably will be some winners, and who loses. If it is the consumer at the grocery store that loses, that is very, very troublesome. If it is the person that turns on the light switch who loses, that is very troublesome.

So, that is why I think this panel is so important. Because I listen and I hear differences of opinion from very, very smart people. That tells me that we have not gotten the right evidence to decide what are the costs and benefits. That is why Senator Inhofe and I have joined together to try to get an understanding. We all want to do the right thing, I believe, but we want to know what the facts are.

So, let me, if I might, turn first to you, Mr. Montgomery, with that kind of backdrop. One of the things that has appeared to me in the analysis that has been done so far, and I have certainly not read every page and word of every analysis, but what I have studied is that there is tendency to project the upside, not very much good information on the downside. Is my perception on that accurate? What is your view of the studies and the research that has been done out there on that issue?

Mr. MONTGOMERY. Yes, Senator, I am afraid you are right. I think the recent EPA study clearly showed biases in this area and I am quite surprised because they took what I would say are the most optimistic estimates of the health benefits, translated them into a huge increase in the size of the U.S. labor force and claimed that would increase our GDP. Well of course it would. If there were more people out there working productively, the economy will do better.

I believe they also in a number of ways made assumptions that were at the most optimistic end of the range on what the costs are. Now, that is not to say that they did not come up with a scenario that is possible, but it is at one end of the scale. Whenever we have tried to do an analysis like this, we try to balance this with the other end of the scale. I think there has been a history in these

EPA perspective reports of putting the very best possible face on the regulations.

Again, and I agree with Senator Inhofe, many of them probably had regulations, many of the past regulations had benefits that far exceeded their costs. But others did not. It not going to help us to distinguish that.

I think, in the case of climate change, we do see in the professional literature a pretty wide range. But we do not see it presented here in the debate in Washington. I think that the answer that you can get is that the best that science and economics can tell you, within a very broad range. But the Administrator is right. Science agrees that we are not going to get very much direct benefit for the United States out of anything we do here in the United States.

It is a global problem and the magnitude of the costs and the benefits of seeing that global problem range from marginally worth doing, if you do it very carefully, and it is not worth doing at all if you do it badly, to those who are much more convinced of the potential disaster and the inefficiency of markets and opportunities for doing something, they would say that it is an easy job. But there is that huge range there and neither science nor economics is going to be able to lower it, reduce it very much, before you have to make decisions.

Senator JOHANNIS. I heard the testimony about how unions have a difference of opinion and I think that is a very fair statement. If you are in a coal mining region, you are going to look at this differently that if you are in another region. But that, I was not hearing so much union versus union as I was hearing there are truly regional differences here that have an economic impact.

I do not now who I ask here, but is that also a piece of what we are looking at that you could hammer, for example, the Midwest, although this may turn out awful there is might be better in another part of the country?

Mr. Allen.

Mr. ALLEN. If I might. I mean, it is a fact that energy issues have always been largely regional in nature. It is a fact that if you are downwind, you have economic and health consequences that are a result purely of your location.

I was so glad to hear you say, Senator, that you have authentic curiosity about the differences of opinion because, as good as this panel has been, and I think we have done our level best to give you good information, we have not had the opportunity to touch on some very important underlying facts here.

In the business that we are in, which is largely national business, we operate in all of the competitive markets in the country, the drivers are really very much about underlying commodity prices. Right now, because of the Marcellus Shale and new technologies, natural gas prices are very low. Because we are actually exporting coal to China, coal prices are very high. Many of the job impacts that we have been hearing thrown around here have as much to do, probably much more to do, with those economic realities than they do with the layering on of new regulations.

It is also important to recognize which plants the new regulations effect because very small coal-fired powerplants, under 25

megawatts for example, actually are not affected by the toxics rule that was proposed yesterday.

So, you know, I just really, it is always a dilemma, I think, for policymakers to get a broad enough view of what really drives outcomes. If you are a business, you have to take all of those variables into effect. If you are a business that has, among other things, made a calculation that environmental policy needs to be rigorous and science based, and that implies certain things about what you need to do, probably should do, but need to do in order to comply with those regulations, and you make the investments, but your competitor is allowed not to or delays it, that creates a fundamental economic unfairness and, frankly, a distortion in the marketplace that is bad for everybody who needs to make particularly large capital investments.

It affects the credit ratings, it affects the costs of capital in ways that hinder American competitiveness. So, we would like to see as thorough and as rich a debate as possible. But it is also very important not to over compartmentalize certain aspects of the economic equation.

Senator JOHANNIS. Yes. You know, I do not want to abuse the privilege of my time, but here is what I would say. What I am looking for is a rigorous analysis that will lead to a right policy choice. I must admit I think there is rigorous analysis going on out there, but here it tends to, I do not know, head off in this direction, if you are against this then you are against clean air and if, you know, and quite honestly it is not a helpful debate. It might be interesting to watch on television but it is not a helpful debate.

Recognizing today that we are in a global environment, and we just flat are, if we do something that puts our job creators on their knees and they are trying to compete with somebody else, well they only have a couple of choices if that somebody else is overseas. They either go over there and create the jobs in China or India or wherever, or they do not survive. For them, it is as stark a reality as that. So, if we choose wrong here, the implications are very, very serious.

That is what I think we need to focus on, is how do we get this right and, in the end, at the end of all of this, are we even going to have an impact? If we are not, we had better be factoring that in, too.

With that, I want to say thank you to each of you. You know, one of the things, Mr. Chairman, that I always like about Mayors, they are direct and I always said that filling potholes and mowing parks was never a political venture. It just was work that needed to be done. I think Mayors are very direct and so Mayor, especially to you, thank you for being here today.

Senator CARPER. Senator Johannis, thanks very much for your insightful questioning. Thank you very much.

I want to go back to Mr. Yann, if I could. As you know, in this country we have been working on our air, cleaner air, for some 40 years. This year, we have several clean air regs that are targeting our utilities, all of which are under court-ordered deadlines.

Based on your past experience, do you feel that utilities can install the control technology that is needed to meet these new regulations in the timeframe required?

Mr. YANN. Senator, we have talked to a number of them and worked with them and everything is doable with a plan, and the plans are being developed. I think we need to be careful of any delay that could put a burden on that timeline and make it a more aggressive schedule.

Senator CARPER. Say that again, about a delay—

Mr. YANN. Any delay would put a burden on this.

Senator CARPER. OK, I understand.

I remember, gosh, about five or 6 years ago representatives from about 10 different utilities came in to see me. They were from all over the country. Senator Alexander and I had been working on a full pollutant bill dealing with sulfur dioxide, nitrogen oxide, mercury and CO₂ emissions and trying to see if there was some way we could set up a market system, a trading system, to harness market forces to reduce SO_x, NO_x and CO₂ emissions, but not mercury.

At the end of the conversation, this one guy from a southern based utility, I think it was a southern utility, but suddenly he said, talking to me, Senator, why do you not do this, you and your colleagues do this, tell us what the rules are going to be in terms of reducing emissions, give us a reasonable amount of time, give us some flexibility and get out of the way. That is what he said. I think that is pretty good advice. I still think that is pretty good advice.

I want to go back to Mr. Allen, if I could. In your testimony, you shared with us the example of the Brandon Shores facility in Maryland. I believe you said your company installed technology to meet a 2006 State reg that took approximately, I do not know, 24, 25, 26 months to install all of the technology and it was completed a year or two ago, maybe in 2009. Is that correct?

Mr. ALLEN. Yes.

Senator CARPER. Do you believe this facility will meet recent EPA regulations of air toxics and SO_x and NO_x?

Mr. ALLEN. Yes.

Senator CARPER. As you know, we have seen several different job studies, I do not know, it is like dueling job studies going on here, we have seen several different job studies citing job creation with clean air regulations. How does your experience at Brandon Shores match up with some of these studies? Are they on target or are they off base?

Mr. ALLEN. Well, I cannot speak to all of the studies. What I can say is that we have numbers that would be very similar to what I heard from Alstom in terms of what it takes to do the actual construction and installation of the equipment.

It is harder for me to speak to the jobs in the supply chain. But, if you think about who the supply chain is, it includes Alstom, it also includes Nucor Steel that we heard Senator Johannis mention, it includes Lehigh Cement, which is a customer of Constellation Energies. It very importantly includes the heavy automotive industry that the United Auto Workers works in.

So, the supply chain contains a great, great, great many jobs. Then there are the constructors, the Bechtels, the Flores, the Peter Kiewits of the country who we depend upon, the Washington International Groups and Shaw and others, and then the engineering

firms that Charles River consults to, the Stone and Websters and the Black and Veatchs and Babcocks and Wilcoxes and all of the rest of them. So, yes, it is essentially, an American industry.

I want to say something else about the jobs associated because we know who the people are who build these facilities. They are, in fact, the same boilermakers and pipe fitters and engineers and steamfitters and laborers and teamsters and others who manage the outages and the maintenance of all of these facilities. These are people who have careers in doing the highly-skilled jobs that are associated with the electric power industry.

So, that tells us two things. It tells us that they are there to be employed and it also tells us that they need the employment in order to pursue their careers. So, I guess I just, that is an important thing to consider when you are wondering about whether or not there are jobs associated with doing the fundamental work of operating the electric power system. It seems, I have always thought that the question sort of answered itself.

Senator CARPER. All right. Good. I like those questions that answer themselves.

I would come back to you, if I could, Mr. Yann. I have heard, I have been told that your company is on the cutting edge of carbon capture and storage technology. Is that a fair statement?

Mr. YANN. Yes, Senator, we currently have 12 projects that are either in engineering or testing of CCS projects around the world and are making progress in that arena.

Senator CARPER. OK. Is your company seeing an uptake in interest in this kind of technology with greenhouse gas regulations in place?

Mr. YANN. No, Senator, we are not.

Senator CARPER. OK. Are you seeing a decrease in interest in this kind of technology with the new greenhouse gas regulations in place? Is the interest going up or down?

Mr. YANN. I would say it is going down, Senator.

Senator CARPER. So, you are seeing fewer utilities expressing an interest in this carbon capture and storage technology?

Mr. YANN. Yes, sir.

Senator CARPER. Why do you think that is?

Mr. YANN. Utilities are in a complex situation. You know, they are trying to serve us, the consumers of power, and trying to serve us as the people who are citizens of the United States. They are trying to work a balancing act. I think you said it very eloquently earlier, please tell us what to do, give us a reasonable time to do it, and we will go do it.

Senator CARPER. Does the price of natural gas, the dramatic drop in the price of natural gas, is that playing a role here?

Mr. YANN. It is complicating the issue.

Senator CARPER. OK. Fair enough. Do you believe that efficiency, we talked about it, you know, and we are trying to get efficiencies in all of our mobile fleets and we are going to come close to doubling the requirements for energy efficiency within our mobile fleets by 2016. But do you think from efficiencies that we can create jobs?

Mr. YANN. Senator, I do not think there is any silver bullet. There is a lot of silver buckshot. I think we have to take advantage

of every opportunity that we can to reach that solution. That is a part of it.

Senator CARPER. All right. We will wrap up by, well, I am going to come back and recognize Senator Barrasso again and then come back and ask one follow-up question. I will telegraph the pitch right now.

One of the things that I try to focus on here is how do we develop consensus. It is a pretty contentious place. We need to try to find consensus in a whole lot of areas, deficit reduction, in terms of healthcare, better outcomes, less money, what are we going to do about the infrastructure and transportation infrastructure, all kinds of things, and we need to develop consensus to really address these complex and difficult issues.

One of the things I am going to ask you all to do, and it will be my last question, is given where you are coming from in your testimonies, where do you think there is agreement among this panel? I am just going to ask everybody here.

Where do you think you agree with respect to cleaner air, increasing jobs, decreasing, where do you agree? Where do you think that you agree that an action might be helpful to us as we try to find consensus on these issues?

OK? That will be my last question. Think about that. Chew on that for a while and, in the meantime, Senator Barrasso is going to chew on you.

[Laughter.]

Senator CARPER. Well, not really.

Senator BARRASSO. Thank you, Mr. Chairman. It really, I have to tell you, it is a privilege to work with this guy, an absolutely outstanding individual.

Mr. Montgomery, if I could, the National Petrochemical and Refiners Association has estimated that about 70 percent of gasoline diesel fuel could end up being imported from refineries in China, India, South America, Africa and the Middle East by 2025, about 15 years from now, if the United States imposes inflexible, unilateral greenhouse gas controls under the Clean Air Act.

To me, that is going to cost hundreds and hundreds of thousands of jobs. I believe that is going to increase the cost of energy in the United States. What is that going to do in terms of jobs in this country with those kind of increased costs related to those kinds of imports, but in terms of the reduction of production and then any additional impacts that you see?

Mr. MONTGOMERY. Thank you, Senator. I think there certainly are jobs that are associated with petroleum refining in the United States and if we do not do the refining here, those jobs will not be here. It is much like the coal mining jobs will not be here if the, if we retire 60 or 80 gigawatts of coal-fired generation because it is more economical to do that than to install pollution controls and operate it under the threat of greenhouse gas emissions.

But the real loser is the American consumer. The fact is that in all of these cases, what we hear are descriptions of the jobs that the United Auto Workers care about, descriptions of the jobs that are provided by Alstom, description of the jobs that are involved in installing pollution controls at Constellation Energy, description, in some cases, of the benefits that a company will get because its elec-

tricity will be lower in cost than someone else's under the regulations.

But the losses are occurring across the board in the economy because these are all increases in costs that are borne by the American consumer. The American consumer is not represented here in Washington by a specific spokesperson who can point to everything that is happening because it is spread broadly across consumers and across U.S. manufacturing.

It is that increase in costs which means that essentially there is, that the consumer is bearing the cost of higher priced, I mean, when there is more labor involved in producing a car, that is a cost. That means the price of the new car is going up. That means either, I mean, there is more man hours per car but there are probably going to be less cars sold. We have seen that over and over again over the past couple of decades.

If there are not cars sold, then people are spending more on cars and they have less money to spend on something else. That is what the effect is and that is the effect of the petroleum refineries going offshore as well. There is less for consumers, consumers have less real income, if you like, to buy things because they are paying for the higher costs of these environmental controls. Some are justified, some are not.

Senator BARRASSO. Thank you.

Thank you, Mr. Chairman.

Senator CARPER. All right, folks, I telegraphed my pitch. You are at the plate. It is a chance to hit one out of the park.

Ms. SOMSON, do you want to go first?

Ms. SOMSON. Certainly. Thank you, Senator. One thing I heard today that pleased me was that everybody is not just concerned about jobs but about good jobs and that good jobs are defined as high-paying jobs and jobs that provide benefits, which we see as pensions and healthcare. I am pleased that this is bipartisan and everybody on our panel seems to agree that that is a high value that we have to keep an eye on because, of course, we have a great concern about the loss of those jobs and the loss of the middle class.

I think it is implicit that everybody cares about oil savings and that, of course, we are all better off if our vehicles, for examples, are more efficient. I would suggest an answer to Mr. Montgomery that, although it is true that the cost of the vehicle goes up, there are considerable savings to the consumer from the advanced technology vehicles. They pay less at the pump and that is money that they can take and spend elsewhere, which stimulates jobs.

With respect to Mr. Montgomery saying that we would have fewer car sales if we were to have more regulations, I think, in fact, that the drop in car sales is because of the economy and the economy has led to such a high unemployment rate, so we are back again to jobs.

So, if we all agree that we need jobs and good jobs, that we all benefit from oil savings and that we have some benefit, even if it might not be, we might argue over how great a benefit, to a healthier environment, I think everybody is really on the same page. If this led to having Congress, once again, take up comprehensive climate change legislation, we think that would be a wonderful thing.

Senator CARPER. All right. Thank you. There is a lot of pent up demand for buying new cars, trucks and vans, and we have gone from a time a few years ago where we were buying in this country 16 to 17 million units a year down to as little as 9 or 10 units. So, there is a lot of pent up demand.

When the economy comes back, as the economy comes back, and people look at their old clunkers in their driveways and garages and out on the streets, well, one of the good things that is coming out of Detroit and other places too are far more energy efficient vehicles. So, hopefully, at a time when folks are looking for a new set of wheels, a lot of the sets of wheels that are available will be getting 30, 40, 50 miles per gallon, even 80 with that new Fisker and Chevrolet Volt.

All right. Mayor.

Mr. HOMRIGHAUSEN. Thank you, Senator. I believe that we can all agree that we need to do what is in the best interests of the entire country in cleaning up our environment. But we also have to be very careful on what steps we take. You know, if the intent is to get away from burning coal, which is a very inexpensive resource, and move it toward natural gas or some other higher priced commodity, we have to be cautious because increased need will increase the costs of natural gas.

People cannot afford to heat their homes with increased costs. They cannot afford their electricity if the electricity price is raised because of natural gas. They cannot afford—

Senator CARPER. I am sorry. I do not understand. You say if the electricity prices raise because of natural gas—

Mr. HOMRIGHAUSEN. Because of the higher cost of natural gas. If you have an increased demand, natural gas is going to increase in costs. Then also—

Senator CARPER. I see demand is going up but the price is going down. I know that seems counterintuitive, but that is what is happening.

Mr. HOMRIGHAUSEN. Well, history shows that the more demand for a product, the more it is going to cost.

Senator CARPER. Unless the supply expands, dramatically, and that—

Mr. HOMRIGHAUSEN. Then you have to be wary of what is the fracking going to do to water supply, you know, there is whole myriad of problems associated with this.

But several years ago, I believe the Chinese were bringing online one new coal-fired powerplant a week. No regulations. When they had the Olympics, they had to shut down two powerplants so the air could be cleaned up so they could have the Olympics which affected Dover Chemical, which one of their products is they need phosphate.

Well, there were two places in the world that they could get phosphate, which was from China or Uzbekistan. Since they could not have the electricity to mine the phosphate, the Chinese raised the prices by 300 percent which put 60 employees of Dover Chemical out of work.

I read a report last week about the beneficial effects of the Clean Air Act from 1990 to 2000 and what struck me as very interesting, it showed a map where all the pollution points were in the United

States, and yet it had Canada and Mexico with no points on the map. So, I was just wondering if pollution follows boundaries.

Senator CARPER. All right. Thank you.

A comment on that. I was born in West Virginia. My dad actually used to work in a coal mine for a while. So, I have a soft spot in my heart still for West Virginia and for the coal industry. I am not interested in putting coal out of business. What I am interested in doing is making sure if we burn it, we have a lot of it, as we burn it to create electricity that we just burn it in a far more, a far cleaner way, a far cleaner way. I will not go the other way because we need to close—

Mr. HOMRIGHAUSEN. Right. I think in order to do that we need to spend some serious dollars on clean coal technology,

Senator CARPER. We have. Now what we need to do is to spend some serious dollars on implementing that technology that Alstom and others have. So, that is part of our challenge.

All right. Thank you.

Mr. Allen? Some closing thoughts?

Mr. ALLEN. Well, what I think what you heard is that everything is connected to everything else.

Senator CARPER. All right. Thanks very much. Mr. Montgomery? [Laughter.]

Senator CARPER. No, back to you, Mr. Allen.

Mr. ALLEN. I also think that you heard a lot of different points of view struggling to understanding, coalesce around, the fundamental value proposition of environmental protection and, at some point, either you think that value is worth the cost or you do not. To the extent that markets can be used to do two things, to express the most efficient way to achieve the value if you believe it is there, and second to test how much consumers are willing to pay for it, then I think you have probably the right formula.

Mr. Montgomery said almost exactly the same thing, if you think about it. He said that the costs, sooner or later, flow through to consumers. He is absolutely right. The question is do consumers want to pay for the value that they get from particularly clean air? I think we should leave that to them to decide.

Senator CARPER. Going back to the example I used earlier between Dover, OH and Dover, DE, the consumers in, the folks who are going to benefit most from clean air from Dover, OH are folks in Dover, DE because of the transport of the emissions. The folks who are going to have to bear, or have been bearing for years, higher healthcare costs, are the people on the East Coast, the Mid-Atlantic and the Northeast. Investments made, in some cases in the Midwest, will actually benefit those of use who live in the rest of our country, at least in the Eastern part of our country, because our healthcare costs are going to go down.

It is hard for me to make an argument. I am trying to compete with a company that is thinking about putting jobs in Dover, OH or Dover, DE and they say well, look at the climate there, go to Dover, OH, they have cheaper electricity costs and their healthcare costs are lower. That is hard for me to compete with. We have actually, not to pick on Dover, we have actually had those battles and they are hard to win.

Mr. ALLEN. I guess I am in the camp of thinking we are all in this together.

Senator CARPER. Good. All right. Thanks.

Mr. Montgomery.

Mr. MONTGOMERY. Thank you. Well, I think the first thing we can probably all agree on is that Ms. Somson and I do not agree about the effects of regulation on the auto industry. I propose that the referee on that be a book by two economists at a more or less Democratic organization, the Brookings Institution, Pietro Nivola and Robert Crandall, who I would defer to on that subject, but I think that they support my point of view.

I may be, again, overly optimistic, but I think that we all agree that in doing these, any of these environmental regulations, it would be very helpful if they are done in a way that their stringency and application and timing responds in a more or less automatic way to what we find out are the costs of doing things, that in many ways we are hearing that it is arbitrary schedules and arbitrary, you know, unit-specific requirements that are not something that are adjustable because of the costs you get the culpability of doing something. That is something really to be avoided.

I would like to believe that that also makes us all agree that there are far better ways of dealing with greenhouse gas emissions than the Clean Air Act authorities of EPA.

Finally, I would love to talk to you about TMDL trading in the Chesapeake because I think that one way we could deal with one of the Golden Rule problems is if Congress took up the subject of a six State trading system to improve the way in which the runoff is managed. But that is an entirely different subject.

Senator CARPER. That is a good one. Maybe we can get Senator Cardin to join us in that conversation.

Thanks. Thanks a lot.

Mr. Yann.

Mr. YANN. Thank you, Senator. I think we all believe in quality clean air and I think we all believe in quality jobs and I think we also believe that the market-based solutions provide the best option for addressing these issues. I think, quietly, I will end it at that.

Senator CARPER. One of the questions that I think President George Herbert Walker Bush faced as he signed into the law the 1990 Clean Air Act Amendments was how are going to reduce sulfur dioxide emissions? We had a real problem with acid rain at the time. We do not hear much about that anymore. I think they wrestled with the question of whether we were going to use a regulatory approach or try to harness market forces and use that approach.

In the end, the approach of using market forces, some of us were skeptical as to whether that would actually work, turned out it worked pretty well and I am told we actually met our sulfur dioxide emission targets in about one-half the time that was anticipated and at about one-fifth the cost. Pretty impressive.

I studied a little bit of economics at Ohio State and later after I got out of the Navy at the University of Delaware. I have always been fascinated by how to harness market forces to drive good public policy behaviors. So, I do not know who came up with that idea, Mr. Montgomery, you know, with acid rain, but I thought it was

very clever. Maybe sometime, somewhere along the way, we can find that to apply to other things.

The other thing I want to say, Laura Haines, who is sitting right here over my left shoulder, hears me say this about every other day. I like to quote Albert Einstein. I am one of the few people here who does. But he used to say, in adversity lies opportunity.

I am, by nature, an optimistic person. But I really think we face plenty of adversity these days, certainly not on the scale of what they face over in Japan right now, but we face plenty of adversity. I think our challenge as we deal with that adversity is to try to derive from it opportunity, to realize opportunity. God knows we need jobs here, we need good paying jobs, we need cleaner air, and we need to reduce our dependence on fossil fuels, especially on oil, from other countries that are undemocratic and unstable.

So, my hope is that we can figure out around here, the reason why, to try to work together and find consensus and that is the reason why I asked all of you to answer that last question was to maybe help plant some seeds for that consensus.

So, we very much appreciate your preparation today, your participation today. Maybe if you are lucky, we will send you a couple of questions, not too many. We would ask you, if you get some of those, that you respond to them promptly. We would be most grateful.

With that, this hearing is adjourned. Thanks so much.

[Whereupon, at 12:08 p.m. the subcommittees were adjourned.]

[Additional statement submitted for the record follows:]

STATEMENT OF HON. FRANK R. LAUTENBERG, U.S. SENATOR FROM THE
STATE OF NEW JERSEY

Madam Chairman, we face a clear and present danger from Tea Party politicians who want to reward Big Polluters by crippling the EPA's ability to enforce the Clean Air Act. The health benefits of the Clean Air Act—particularly for our children—are well-documented. Last year alone, the law prevented 1.7 million cases of childhood asthma and more than 160,000 premature deaths, according to EPA. But beyond its environmental and health benefits, the fact is this law is also a critical tool for our economy.

For many years, I led a business that I co-founded with two friends—a New Jersey company that now employs 45,000 people in 23 countries. As any business person will tell you, virtually nothing is more important to a company's productivity than the well-being of its employees. Clean air is essential to that well-being. When the air is dirty, health care costs climb and productivity plunges. Simply put—employees who can't breathe are employees who can't work.

Last year, there were 13 million fewer lost work days in our country, thanks to the Clean Air Act. Make no mistake: As pollution levels have fallen, the U.S. economy has grown. Overall, the economic benefits of the Clean Air Act are estimated at more than 30 times the cost of compliance. Our country's gross domestic product—the value of all the goods and services we produce—is at least 1.5 percent higher today than it would have been without the Clean Air Act, according to research from Harvard University.

This law is also an employment generator. The technology that our country has developed to combat air pollution has spawned thousands of jobs across a variety of industries. The environmental technology industry as a whole does more than 300 billion dollars in business every year and has created 1.7 million jobs. America leads the world in the export of environmental products—all proudly stamped with the "Made in the U.S.A." label. But the Tea Party wants to ignore the Clean Air Act's success. They want to ignore the Supreme Court and scientists at the EPA who agree the Clean Air Act is a tool we must use to stop dangerous pollution. All so they can give a free pass to polluters. If this happens, we'll see more employees calling in sick, more parents taking off work to care for asthmatic children, fewer clean energy jobs and fewer business opportunities for the environmental tech sector.

So I look forward to hearing from today's witnesses about how we can defend the Clean Air Act—not decimate it—and continue using this historic law to protect public health, reduce our dependence on oil and produce more clean energy jobs in our country.

