

CLEAN ENERGY

HEARING

BEFORE THE

COMMITTEE ON

ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

TO

RECEIVE TESTIMONY ON S. 2146, THE CLEAN ENERGY STANDARD ACT
OF 2012

MAY 17, 2012



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CLEAN ENERGY

THURSDAY, MAY 17, 2012

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 9:33 a.m. in room SD-366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman presiding.

OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

The CHAIRMAN. OK, why don't we get started? Thank you all for coming.

Today our hearing is on S. 2146, the Clean Energy Standard Act of 2012. This is a bill I introduced with a number of our colleagues. I think there are 11 of us on the bill. Its co-sponsors: Senators Wyden, Sanders, Mark Udall, Franken, Coons. Several who are not on our committee are also co-sponsoring the bill, Senators Kerry, Whitehouse, Tom Udall and Senators Feinstein and Merkley.

So the purpose of the Clean Energy Standard is to establish a national standard for electricity that would make sure that we leverage the clean resources that we have today and would also provide a continuing incentive to develop cheaper and cleaner energy technologies in the future. By design it would drive continued diversity in our sources of energy. It would also allow each region to deploy clean energy using resources appropriate to that region. The Clean Energy Standard does this in a way that is intended to support homegrown innovation and manufacturing and keep America competitive in the global clean energy economy.

This is not the first Clean Energy Standard to be proposed. It's certainly not intended as a partisan proposal. In the last Congress during the discussion of a renewable electricity standard, in fact we had a lot of discussion about that in this committee, several members on the Republican side publicly voiced their support for a more inclusive standard, not just focused on renewable energy, but on other types of energy as well including nuclear power and hydro power and a variety of other options.

At the beginning of this Congress President Obama moved in that direction by calling for a Clean Energy Standard in his 2011 State of the Union speech. He also addressed the proposal again and urged Congress to move ahead on something of this type in his 2012 State of the Union speech.

As part of the development process for the legislation we received input from hundreds of stakeholder groups and citizens. The En-

ergy Information Administration conducted a comprehensive set of policy analyses. The Clean Energy Standard design was the topic of several academic workshops and industry meetings.

We tried to take all of that feedback and incorporate it in what we have proposed.

The Clean Energy Standard will take all electricity generating technologies that exceed the carbon efficiency of the current state-of-the-art, super critical coal generation and award them credits scaled to their relative improvement in carbon intensity over that baseline.

Zero carbon sources such as nuclear and renewables will get a full credit per kilowatt hour produced.

Advanced coal technologies such as oxy fuel combustion will get partial credit.

Natural gas will get about a half a credit and so on.

Utilities that sell electricity at retail will acquire and turn those credits in to meet a standard that overall will start off being fairly easy to meet. The standard though, will become cleaner and more stringent over time. The result is intended to be a realistic and a predictable market pull on advanced energy technologies. By having a long term, predictable market for advanced electricity generation the legislation is intended to provide innovators with confidence and the ability to make their best case to investors and project financiers.

This proposal is only 25 pages in length. It is, we believe, simple and straight forward. We think it would also, though, have a transformative effect in the power sector.

The Energy Information Administration projects that adopting the CES would drive substantial amounts of clean energy production across a diverse set of sources including wind, solar, nuclear, biomass and natural gas. It would also drive enhanced energy efficiency in particular in the industrial sector.

EIA projects that it would reduce emissions from the power sector by 20 percent below their reference case in 2025 and by 44 percent in 2035.

This mix of benefits has led to support for the legislation from a diverse group of stakeholders. We will hear from some of those today.

The discussion that we're having today on this policy proposal is an important one to have. Even though we are in a difficult political environment the challenges that the Clean Energy Standard seeks to address and the ambitious goals that it is intended to achieve are important ones for the country. If we really want energy innovation to flourish here at home we really need more predictable, long term policy signals. If there are better ideas for how we should do that then what we've proposed in this Clean Energy Standard, I hope we can hear something about those today at the hearing.

Before I introduce the witnesses, let me call on Senator Murkowski for any opening remarks she'd like to make.

**STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR
FROM ALASKA**

Senator MURKOWSKI. Thank you, Mr. Chairman. Appreciate you scheduling the hearing, your focus on this as an issue.

Welcome to the witnesses. Thank you for being here.

I think one of the good things about this committee is the quality of feedback that we receive here, the role that it plays in informing our decisionmaking. Some of the issues that we consider are, of course, pretty complicated. They require considerable thought. A Clean Energy Standard, the subject of this morning, is certainly one of those.

You've noted that the President's role in proposed a CES when he mentioned this in his State of the Union address back in January 2011. At that time I joined the Chairman in releasing a White Paper, asking for feedback on it. I was really, very impressed and appreciative with the responses we received.

How adept the stakeholders were at exploring the very specific challenges and opportunities associated with what was a pretty general proposal. From threshold questions of what resources should count as clean to who should be regulated under a CES. We received a great deal of information. I truly thank those who participated in that effort and the information that they provided to us.

There was a lot of inquiry, work and patience. I think that the Chairman has clearly benefited from that in getting to this point with a bill now written, introduced, analyzed. While some are fully convinced a Federal CES is the way to go, there are quite a few others that disagree with that approach.

To me, the biggest question and the one that I hope we'll have an opportunity to talk about this morning is whether the American people really want a CES. Whether it's appropriate in light of what States are already doing.

Now Mr. Chairman, you've mentioned that there have been those that in the past have suggested that incorporating a Clean Energy Standard, one that expands beyond the renewable energy is something that others on both sides of the aisle have mentioned and have encouraged. I acknowledge that I have been one that says we need to look broader. But I ultimately decided not to co-sponsor the bill for a couple different reasons.

The responses to the White Paper while again, very detailed in their analysis and consideration, clearly lack sufficient consensus. I think there's reasonable disagreement about whether or not this type of mandate is appropriate at the Federal level. There's some other things, other events.

First and foremost, we've been reminded of the importance of affordable energy. Most of the focus lately has been on gasoline prices, but electricity costs are also going up. Bringing energy prices down, I think, should be our objective, not driving them up today or in the future as some analysis have projected that a CES would do.

I recognize that affordability is not the only goal. We all want to have cleaner energy sources. Federal mandates, though, are just one of the tools at our disposal. As it turns out I think we recognize that they can be pretty blunt instruments. In the energy space, in

particular, Federal mandates make it difficult to account for regional differences, consumer preferences and international competitiveness.

Hanging over all of this is our more recent experience in health care which shows just how unpopular mandates can be. What we should remember is that we're not necessarily limited to one policy or one option for addressing our energy challenges. My preference would be to increase funding for energy innovation with the revenues that we generate from increased domestic production of oil, gas, coal, other resources.

If we plan ahead, we could develop a long term policy that allows those resources to work themselves out of a job by paying for the commercialization of newer, cleaner alternatives. In the meantime, we protect families, businesses from added costs and burdens.

Finally I don't think we can have an honest conversation about new energy policies without acknowledging, evaluating and accounting for the slew of new, stringent regulations that are being imposed under existing statutes. I think we need to really critically assess this habit that we seem to have of piling one policy on top of another. We need to kind of sort through all that so that it's clear where the priorities are.

Mr. Chairman, I am happy to be here this morning. I hope the conversation is merely a small part of a much larger one about our Nation's energy goals and the most appropriate tools for achieving them.

I thank you for your efforts in this area.

The CHAIRMAN. Thank you very much.

We have 2 panels of witnesses, the first 2 witnesses from the Administration.

The Honorable David Sandalow, who is the Acting Under Secretary of Energy and Assistant Secretary for Policy and International Affairs in the Department of Energy.

Also Dr. Howard Gruenspecht, who is the Acting Administrator and the Deputy Administrator with the Energy Information Administration.

We will give them whatever time they need to make their points. Then we will have some questions of them. Then we will go onto the second panel.

So Mr. Sandalow, thank you for being here. Go right ahead.

STATEMENT OF DAVID B. SANDALOW, ACTING UNDER SECRETARY OF ENERGY AND ASSISTANT SECRETARY FOR POLICY & INTERNATIONAL AFFAIRS, DEPARTMENT OF ENERGY

Mr. SANDALOW. Thank you, Chairman Bingaman and Ranking Member Murkowski and all the members of the committee for the opportunity to speak to you today about S. 2146, the Clean Energy Standard Act of 2012 and the President's goal of generating 80 percent of our electricity from clean sources by 2035.

Let me start by apologizing for my voice. If it cracks, it's not due to emotion as strongly as I support the Clean Energy Standard. But it's a persistent cold which is going around, not just the Forrestal Building. But I understand from somebody yesterday the Hill as well.

Members of the committee, we're currently engaged in a global race to develop, manufacture and deploy clean energy technologies. China, Germany, and many other countries are investing heavily in clean energy. We can't risk falling behind.

With American ingenuity and manufacturing know how we can lead the world in clean energy. Let me repeat that. With American ingenuity and manufacturing know how we can lead the world in clean energy.

The President set forth an all of the above energy strategy for the 21st century that develops every source of domestic energy including clean energy. A core part of the President's vision is his call for the U.S. to generate 80 percent of our electricity from clean sources by 2035. A Clean Energy Standard is a technology neutral approach to achieving that goal. It works by setting a target and letting investors and entrepreneurs determine the best and most effective technologies to deploy to meet it. These include nuclear power, clean coal, efficient natural gas generation and renewable sources such as wind, solar, geothermal, hydropower and biomass.

There are many ways to define a Clean Energy Standard to meet the President's goal. There are many possible energy mixes that could realize it. My colleague, Dr. Gruenspecht, from the Energy Information Administration has shared with you some modeling of Senator Bingaman's proposed approach.

I want to emphasize Dr. Gruenspecht's statement in his testimony that EIA's modeling results represent one potential future, but not the only one. Because the Clean Energy Standard lets the market drive the outcome the evolution of clean energy technologies over time will determine what our energy mix will look like in 2035. As a result, the policies we put in place and the investments we make now will play a large part in determining that future energy mix. The President and the Administration remain committed to making the investments in innovation that will ensure abundant and affordable, American made clean energy.

Mr. Chairman, the administration welcomes your leadership in proposing the Clean Energy Standard Act of 2012 which is an important step toward achieving the President's vision. We look forward to working with the Chairman and with Congress on the critical work of ensuring American leadership in the clean energy economy.

So for my part I want to spend the balance of my time today talking about the 5 principles which the President laid out in the State of the—when he called for a Clean Energy Standard. He's called for it twice, as you mentioned, Mr. Chairman, in 2 State of the Union addresses. He set forth 5 principles in his blueprint for a secure energy future.

Those 5 principles are crediting a broad range of clean energy sources, doubling the share of clean electricity over the next 25 years, protecting consumers from rising energy bills, ensuring fairness among regions and promoting new and emerging clean energy technologies. So let me discuss each of these principles in turn.

First, the President proposed including electricity generated from a diverse range of clean energy sources including renewable sources, nuclear power, efficient natural gas plants and clean coal technologies that capture and store carbon dioxide. In addition any

clean generation technologies developed in the future should be eligible for credit to provide an incentive for innovators and entrepreneurs.

Second, the President proposed to double the share of clean electricity over the next 25 years. He's proposed the goal of generating 80 percent of our electricity from clean sources by 2035. That's a bold, but achievable goal that would roughly double the share of electricity we get from clean sources. It provides a critically, long term price signal to investors that will reduce uncertainty and draw capital off the sidelines into investments in the electric power sector creating jobs, enhancing our national security and helping protect public health.

The President's third principle is protecting consumers from rising energy bills. In part this can be achieved by drawing on a diverse range of energy sources and using a steadily rising target that gives the market time to invest in the most cost effective clean energy sources available. In addition, key point energy efficiency plays a key role here. The Administration supports a variety of complementary policies and measures to accompany a Clean Energy Standard each tailored to the unique challenges of the sector.

The President's fourth principle is ensuring fairness among regions. Different regions of the country have relied on different energy resources. The President's principles state that any Clean Energy Standard should take these differences into account, both regionally and across rural and urban areas.

The President's fifth principle is promoting new and emerging clean energy technologies. Over the past 3 years the United States has made substantial progress in clean energy. We've nearly doubled the amount of electricity generated from renewable sources such as wind, solar and geothermal. We've enabled the world's largest wind farms and several of the largest solar projects.

We're making good progress. But more needs to be done. Government has an important role to play. But a market based mechanism is the best tool to harness the ingenuity of the American people and build our clean energy future.

That's why we need the Clean Energy Standard. By establishing a market for domestic clean energy technologies and providing a long term price signal, the private investors need, we can move billions of dollars of capital off the sidelines and into investments in the electric power sector that will drive innovation and create jobs throughout the economy.

Thank you, Mr. Chairman. I look forward to taking your questions.

[The prepared statement of Mr. Sandalow follows:]

PREPARED STATEMENT OF DAVID B. SANDALOW, ACTING UNDER SECRETARY OF ENERGY AND ASSISTANT SECRETARY FOR POLICY & INTERNATIONAL AFFAIRS, DEPARTMENT OF ENERGY

Chairman Bingaman, Ranking Member Murkowski, and Members of this Committee: Thank you for the opportunity to speak about S. 2146, the Clean Energy Standard Act of 2012 (CESA), and how this relates to the President's goal of generating 80% of our electricity from clean sources by 2035.

We are currently engaged in a global race to develop, manufacture, and deploy clean energy technologies. Countries like China and Germany are investing heavily in clean energy, and we can't risk falling behind. With American ingenuity and American manufacturing know-how, we can lead the world in clean energy. The

President has set forth an all-of-the-above energy strategy for the 21st century that develops every source of domestic energy, including clean energy.

A core part of the President's vision is his call for the nation to generate 80 percent of our electricity from clean sources by 2035. A Clean Energy Standard (CES) is a technology-neutral approach to achieving that goal. It works by setting a target and letting investors and entrepreneurs determine the best and most-effective technologies to deploy to meet it. These include nuclear power, clean coal, efficient natural gas generation, and renewable sources like wind, solar, geothermal, hydro-power and biomass.

Of course, there are many ways to design a Clean Energy Standard to meet the President's goal, and there are many possible energy mixes that could realize it. My colleague, Dr. Howard Gruenspecht from the Energy Information Administration (EIA), has shared with you some modeling of Senator Bingaman's proposed approach. I want to emphasize his statement that EIA's modeling results represent one potential future, but not the only one. Because a CES lets the market drive the outcome, the evolution of clean energy technologies over time will determine what our energy mix will look like in 2035. As a result, the policies we put in place and the investments we make now will play a large part in determining that future energy mix. The Administration remains committed to making the investments in innovation that will ensure abundant and affordable American-made clean energy.

The Administration welcomes Chairman Bingaman's leadership in proposing CESA, and looks forward to working with the Chairman and with Congress on the critical work of ensuring American leadership in the clean energy economy. For my part, I want to spend the rest of my time today talking about the President's vision for a Clean Energy Standard, which he first called for in last year's State of the Union address and proposed in more detail in the Blueprint for a Secure Energy Future, released in March 2011. In the Blueprint, President Obama set forth five principles for a Clean Energy Standard. They are:

- Credit a broad range of clean energy sources
- Double the share of clean electricity over the next 25 years
- Protect consumers from rising energy bills
- Ensure fairness among regions, and
- Promote new and emerging clean energy technologies

Let me discuss each of these principles in turn.

1. Credit a broad range of clean energy sources

In the Blueprint, the President proposed including electricity generated from a diverse range of clean energy sources, including renewable sources, nuclear power, efficient natural gas plants and clean coal technologies that capture and store carbon dioxide. In addition, any new clean generation technologies developed in the future should be eligible for credit to provide an incentive for innovators and entrepreneurs.

One way to achieve this principle of drawing on a diverse range of energy sources is to assign full or partial credit to generation technologies based on a simple metric, such as emissions per unit of output. As one example of how this can be done, CESA gives credit to all the technologies I just mentioned based on their carbon intensity relative to a benchmark of 0.82 metric tons per megawatt-hour, or roughly the same emissions rate as a modern supercritical coal plant.

2. Double the share of clean electricity over the next 25 years

The President has proposed a goal of generating 80% of our electricity from clean sources by 2035. This is a bold but achievable goal that would roughly double the share of electricity we get from clean energy sources. A Clean Energy Standard will provide a long-term price signal to investors that will reduce uncertainty and draw capital off the sidelines into investments in the electric power sector that will create jobs, enhance our national security, and help protect public health.

3. Protect consumers from rising energy bills

The President has also said that any CES should be tailored to protect consumers from rising energy bills. In part this can be achieved by drawing on a diverse range of energy sources and using a steadily rising target that gives the market time to invest in the most cost-effective clean energy sources available. In addition, energy efficiency plays a key role here. The Administration supports a variety of complementary policies and measures to accompany a Clean Energy Standard, each tailored to the unique challenges of a given sector. These include energy efficiency standards; the ENERGY STAR program; appliance labeling; weatherization; tax credits, grants, and loans for efficiency upgrades and energy efficiency technologies; the proposed Home Star rebate program; and partnerships with the private sector and states and localities to improve building and industrial energy efficiency.

The savings from these energy efficiency policies translate into lower projected household energy bills in the future. In fact, EIA's modeling projects that the average household will pay five dollars less per month for energy in 2035 than in 2011 under CESA, largely thanks to our current energy efficiency policies. We can do even better by realizing the full energy efficiency savings opportunity through sustained effort at the federal, state, and local levels.

While many of the energy efficiency opportunities can be tapped by complementary policies, I want to call out one important example of clean generation that can also improve energy efficiency: combined heat and power (or CHP). CHP can lead to significant cost savings for industrial energy consumers, help revitalize America's manufacturing base and reduce greenhouse gas emissions. That's why the Administration supports issuing clean energy credits to CHP generation, which is something that CESA also does.

Finally, there are additional CES design options that could further reduce electricity prices for consumers. In CESA, excluding older generators from both crediting and obligation leads to a transfer of money from consumers to these generators that can increase over time. Such transfers could be mitigated by including these older clean sources in utility obligations and giving them a partial credit that is smaller than the rising implicit credit they receive under the approach taken in CESA. Another option is to include an alternative compliance payment (or ACP) that acts as a safety valve if costs rise unexpectedly. CESA provides one example of how an ACP can be designed.

4. Ensure fairness among regions

Turning to the principle of fairness among regions, different regions of the country have relied on different energy resources. The President's principles state that any CES should take these differences into account, both regionally and across rural and urban areas. Again, ensuring a diverse set of energy sources is an important part of meeting this principle, since it gives all regions of the country the opportunity to tap their own sources of clean energy. Another way to promote regional equity is by focusing on new clean generation, in order to give every region a similar starting point—while at the same time crediting states that have been early movers.

5. Promote new and emerging clean energy technologies

Over the past three years, the United States has made substantial progress in clean energy. We've nearly doubled the amount of electricity generated from renewable sources like wind, solar, and geothermal, and we've enabled one of the world's largest wind farms and several of the largest solar power projects. Through the Title XVII and Advanced Technology Vehicle Manufacturing loan programs, the Department of Energy is supporting over 30 clean energy and advanced vehicle technology deployment projects that are expected to employ nearly 60,000 Americans. It has issued conditional commitments for loan guarantees to support the first new commercial nuclear power plant construction in decades. With \$3.25 billion in research, development, and demonstration investments since 2010, DOE has been working with industry to keep the United States at the forefront of carbon capture, utilization and storage technologies.

We're making good progress, but more needs to be done. Government has an important role to play, but a market-based mechanism is the best tool to harness the ingenuity of the American people and build our clean energy future. This is why we need a Clean Energy Standard. By establishing a market for domestic clean energy technologies and providing the long term price signal that private investors need, we can move billions of dollars of capital off the sidelines and into investments in the electric power sector that will drive innovation and create jobs throughout the economy. Creating a market here at home for the clean energy technologies of the future will help ensure that these technologies are developed and manufactured in America instead of being imported from abroad. As Secretary Chu has said: America is the most innovative country in the world, but "invented in America is not good enough. We need to ensure that clean energy technologies are invented in America, made in America and sold around the world." A Clean Energy Standard is part of an all-of-the-above strategy that will tap into diverse sources of energy here at home, keeping our energy supply clean, affordable and secure.

The Administration thanks Chairman Bingaman for his leadership in this vital issue. We look forward to working with members of this Committee to further develop this proposal, and I look forward to responding to your questions.

The CHAIRMAN. Thank you very much.

Dr. Gruenspecht, you folks have done a lot of analysis of this proposal. We appreciate all the hard work that's gone into that. If you

could highlight what you've concluded and anything else you think we need to know, we'd appreciate it.

STATEMENT OF HOWARD GRUENSPECHT, ACTING ADMINISTRATOR, U.S. ENERGY INFORMATION ADMINISTRATION, DEPARTMENT OF ENERGY

Mr. GRUENSPECHT. Mr. Chairman, Ranking Member Murkowski, members of the committee, certainly appreciate the opportunity to appear before you today. As you well know, the Energy Information Administration does not promote or take positions on policy issues. We have independence with respect to the information we provide.

So our views should not be construed as representing those of the Department or other Federal agencies. But my colleague and friend, David Sandalow, has that well covered and is here to answer all your difficult questions.

At the Chairman's request EIA recently analyzed the potential impact of the Clean Energy Standard Act on the development of future electricity markets and protected and sorry, projected, carbon dioxide emissions from electricity generation. EIA's full report is attached to my testimony and detailed results are available on the EIA website. Let me briefly summarize some of our main findings.

As expected given its underlying structure, the proposal leads to a substantial decline in coal fired generation. While generation fueled by nuclear energy, natural gas and non hydro renewable sources all increase as shown in Figure one of our report. This result reflects the ability of nuclear and renewable generation to earn credits toward meeting the target and the partial crediting of natural gas generation.

In contrast, most coal generation and really all existing coal generation is not able to earn credits. Our results suggest a modest increase in combined heat and power in the industrial and the commercial sector. But we find that carbon capture and sequestration technology does not appear to play a significant role in compliance.

As you mentioned in your opening statement, projected carbon dioxide emissions in the electric power sector are reduced substantially by the proposal. 44 percent below the projected reference case level in 2035 which also happens to be about 44 percent below their level in 2005, as shown in Figure 3 of our report. Overall, carbon dioxide emissions related to energy in 2035 are about 18 percent lower than in the reference case.

Impacts on electricity prices over the next decade are minimal. But the price impacts then rise as shown in Figure 4 of our report. National average electricity prices to all users are less than 5 percent above those in the Annual Energy Outlook 2012 early release reference case through 2025. But by 2035, they are about 18 percent above the reference case level.

Impacts on natural gas prices are greatest in the early years then fall over time. The value of natural gas as a compliance option falls significantly as the clean energy target share eventually exceeds the credit value for natural gas fired generation.

You know, we often focus on national measures. But it's important to recognize that impacts and particularly, impacts on electricity prices differ across States and regions reflecting variation in clean energy opportunities. Even within a given State or region,

price impacts may vary substantially between customers served by covered retailers and those served by small retailers that are exempt from the requirements of the legislation.

The general price impact contours of the exemption which are examined in our report, vary depending on the State level regulatory structure in place, regulator discretion, the clean energy target level that applies at any point in time and the relative shares of load that are served by covered versus exempt sellers in each State or region.

As with all projections there's considerable uncertainty about how market conditions and technology cost and performance will evolve over time. I think we're relatively confident based on this and previous analyses that a CES along the lines outlined in your legislation would lead to increased reliance on generation from natural gas, nuclear and renewables. But the exact mix of technologies could vary significantly under alternative assumptions.

I think 2 factors stand out as key uncertainties.

One is the uncertainty about the ability of the nuclear industry to ramp up quickly even with the incentives that would be provided by the Clean Energy Standard. We did do sensitivity analysis of the scenario with no additional nuclear plants built beyond what we have in the reference case. That sensitivity suggests that a mix of natural gas, wind and solar generation would largely compensate for the lack of additional qualifying nuclear generation.

Second, although many agree that the use of sustainable biomass fuels should result in net zero carbon emissions over a long period of time, there is disagreement in the literature about the impact, you know, and importance of near term carbon emissions from these resources and some of the long term indirect effects. For this study we did assume that biomass would earn a full credit for each megawatt hour of generation consistent with current EIA and EPA accounting practices. But the legislation does leave to the Secretary of Energy a determination about the ultimate crediting of biomass.

We did do a little bit of sensitivity analysis. What if it did not get a full credit? What if it got a half credit? What if it got zero credit? That suggested, again, a shift toward natural gas and other renewable resources.

So in conclusion, while we don't take policy positions, EIA's data analysis and projections are certainly meant to assist you and other policymakers in their energy deliberations. We've often responded to requests from this committee for data and special analyses. I want to assure you that we stand ready to do over the coming weeks and months.

As always, I'd be happy to answer any questions you might have. Thank you very much.

[The prepared statement of Mr. Gruenspecht follows:]

STATEMENT OF HOWARD GRUENSPECHT, ACTING ADMINISTRATOR, U.S. ENERGY
INFORMATION ADMINISTRATION, DEPARTMENT OF ENERGY

Mr. Chairman and Members of the Committee, I appreciate the opportunity to appear before you today to discuss recent analysis of the proposed Clean Energy Standard Act of 2012 (CESA) by the U.S. Energy Information Administration (EIA).

EIA is the statistical and analytical agency within the U.S. Department of Energy. It collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding

regarding energy and its interaction with the economy and the environment. EIA is the Nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. Therefore, our views should not be construed as representing those of the Department of Energy or other federal agencies.

Projected Impacts of the CESA

At the request of Chairman Bingaman, EIA analyzed the potential impact of the proposed CESA legislation on the development of future electricity markets and projected carbon dioxide (CO₂) emissions from electricity generation. Our report, issued earlier this month, is provided as an attachment to this testimony. The CESA analysis scenario is referred to in the report as the BCES12 case, to distinguish these results from those we reported on in November of 2011 regarding a closely-related set of proposals. Please note, however, that the details of CESA vary significantly from the details of the clean energy standard (CES) policies that EIA has previously reported on, including the treatment of small utilities, credit banking, excluded generation, and alternative compliance payments. This report is based on EIA's Annual Energy Outlook 2012 Early Release Reference case.

As might be expected from the underlying structure of the proposal, generation fueled by nuclear energy, natural gas, and non-hydro renewable sources all increase, as shown in Figure 1 of the attached report. This is a direct result of the ability of nuclear and renewable generation to earn credits toward meeting the target, and the partial crediting of natural gas generation toward meeting the target. In contrast, most coal generation is not able to earn credits, so its use declines. Although the CESA proposal has specific language allocating credits for both combined heat and power (CHP) and carbon capture and sequestration (CCS) technologies, neither plays a significant role in compliance. CHP generation does increase moderately, but growth is limited by a number of factors, including the limited period in which CHP facilities can earn their full, net value for each qualifying credit, as well as the small size of the CHP market relative to the bulk electricity supply market.¹ CCS technologies are projected to remain less competitive than other qualifying sources.

The approach to awarding credits to generation in the proposal is directly tied to the carbon intensity of each technology, or the tons of carbon emitted per kilowatt-hour generated. As a result, projected CO₂ emissions in the electric power sector in 2035 are 44 percent below the projected Reference case level and 44 percent below their level as of 2005, as shown in Figure 3 of the attached report. Although impacts of the proposal are largely felt within the electric power sector, there are opportunities for certain combined heat and power projects in other sectors to contribute to overall CO₂ emissions reductions. Projected energy-related emissions for all sectors in 2035 are about 18 percent lower than in the Reference case. Nearly all of these overall reductions occur in the electric power sector.

The CESA proposal allows affected electricity retailers to bank any excess credits earned in a given year, and use them toward compliance indefinitely into the future. This banking option encourages early compliance efforts and provides for relatively stable growth in the credit price. In addition, affected companies may pay an "alternative compliance payment" (ACP) at any time in lieu of procuring qualifying generation. However, use of the ACP is projected to be limited, absent constraints on the rapid expansion of nuclear power. The projected credit price starts at around \$20 per megawatt-hour (MWh) in 2015, rising to almost \$80 per MWh by 2035 (both in real 2010 dollars).

Impacts on electricity prices over the next decade are minimal, but price impacts then rise, as shown in Figure 4 of the attached report. Projected national average electricity prices start to rise after 2020. National average electricity prices are less than 5 percent above those in the AEO 2012 Early Release Reference case through 2025, but by 2035 they are 18 percent above the Reference case level. Impacts on natural gas prices are felt the most in the early years, and are gradually ameliorated over time. Increasing the dispatch of existing natural gas plants provides a quick, low-cost route for early compliance efforts, but the value of natural gas as a compliance option is significantly reduced as the clean energy target share starts to exceed the credit value for this resource. That is, a resource that can only earn 50 percent of a credit is less valuable at achieving an 80 percent target than a resource earning more than 80 percent of a credit.

¹ CESA also includes a provision that provides additional CES credits to CHP facilities for displaced heat load under procedures to be established by the Secretary at a later date. That provision was not modeled.

Variability of Regional Impacts

Impacts on electricity prices are not the same everywhere in the country, as the stock of existing clean energy capacity and opportunities for additions to clean energy capacity vary across states and regions. In addition, even within a given state or region, electricity price impacts may vary substantially between customers served by covered and exempt retailers. “Small” electricity retailers, as defined in the proposal, are exempt from requirements to purchase credits, and thus do not have to recover direct compliance costs in their rates. Covered retailers, however, may have to pass-on these direct compliance costs.

Full analysis of the impacts of the small retailer exemption is beyond the resolution of this analysis. However, we were able to assess the general price impact contours, which vary depending on the State-level regulatory structure in place, regulator discretion, the clean energy target level, and the relative share of the load that is served by covered versus exempt retail utilities. In addition, net compliance costs are affected by whether or not a given retail utility, exempt or covered, owns qualifying resources and has excess credits to sell into the market. EIA’s results suggest that there is a potential for a large divergence in prices paid by customers of covered and exempt sellers as the target increases. By 2030, CES-induced compliance costs could result in electricity price levels that are about 3 percent to 30 percent higher for covered retailers than for exempt retailers in the same region.

Other Uncertainties in the Analysis

As with all projections, there is considerable uncertainty about how market conditions and technology cost and performance will evolve over time. This analysis only looked at the potential impacts of a CES under one set of assumptions. While we are relatively confident, based on this and previous EIA analyses, that a CES will lead to increased reliance on generation from natural gas, nuclear, renewables and, potentially, fossil plants with CCS, the exact mix of technologies chosen could vary significantly under alternative assumptions.

While projecting the future of national energy markets is inherently uncertain, two factors stand out as key uncertainties in this analysis. First, there is uncertainty about the ability of the nuclear industry to ramp up quickly even with the incentives that will be provided by CESA. While new nuclear capacity is once again under construction in the United States, a very rapid ramp-up could prove to be challenging, especially if problems affecting the operation of the existing fleet of nuclear plants or cost overruns and/or schedule delays in the building of new plants occur and result in reduced generating company or public support for nuclear power. Sensitivity analyses of a scenario with no additional nuclear plants built beyond the Reference case capacity indicate that a mix of natural gas, wind, and solar generation would largely compensate for the lack of qualifying nuclear generation. Such a scenario would also result in use of the ACP for compliance in lieu of qualifying generation.

Second, the proposal does not specify a credit value for generation from biomass resources. While many analysts take the view that the use of sustainable biomass fuels should result in net zero carbon emissions over a long period of time, there is disagreement in the literature about the impact and importance of near-term carbon emissions from these resources and the possibility that sustainable biomass fuels could have adverse indirect effects even over an extended time period. CESA requires the Secretary of Energy to determine appropriate credit values for biomass feedstocks based on a proposed study from the National Academy of Sciences (NAS). Absent a ruling from the Secretary or the results of the NAS study, EIA assumed that biomass would earn a full CES credit for each MWh of generation. This assumption is consistent with prior EIA reports and analysis that assumes biomass to be a net-zero carbon resource. Sensitivity analysis of scenarios with a half or zero credit for biomass indicate that biomass-based compliance would shift to natural gas and other renewable resources, with little impact on credit prices.

Conclusion

As I noted at the outset, while EIA does not take policy positions, its data, analyses, and projections are meant to assist policymakers in their energy deliberations. EIA has often responded to requests from this Committee and others for data and special analyses, and I want to assure you that we stand ready to do so over the coming weeks and months.

This concludes my testimony, Mr. Chairman and Members of the Committee. I would be happy to answer any questions you may have.

The CHAIRMAN. Thank you both very much.
Let me start with 5 minutes of questions.

First, let me ask Mr. Sandalow: The EIA analysis that Dr. Gruenspecht just summarized indicates that there would be, under this proposal, an increase of a few percent in electricity rates nationally by 2025 and the increase would be up to 18 percent by 2035. I guess one obvious question is would that increase in electricity rates that he's talking about there be expected to translate into increased bills to consumers directly or is there any way to calculate what the actual impact would be on consumers?

Mr. SANDALOW. It's a very important point, Chairman Bingaman. So thank you for your question.

The answer is no. Under the EIA analysis, as I understand it, in 2035 household energy bills would actually be lower than they are today by about \$5 per household. That's the result of the combination of energy efficiency policies in the Clean Energy Standard working together.

We can achieve significant savings in the future, as we have in the past, for Americans by promoting these complementary energy efficiency policies.

The CHAIRMAN. Dr. Gruenspecht, is that an accurate description of what your analysis shows or does your analysis lead to that conclusion?

Mr. GRUENSPECHT. I would say it's accurate. In our reference case we did have a projection of falling residential electricity bills relative to the 2010 level. Some of those bills have already started to fall a little bit with the decline in the natural gas prices and the like.

So yes, the increases that we talk about.

First of all the 18 percent is for all consumers and residential rates would go up less than that.

Second of all, there is lower consumption of electricity which figures into bills as well.

Households are getting a little bit smaller which again, figures into bills.

So it's really a combination of factors. But what David says is exactly right.

The CHAIRMAN. Let me ask Dr. Gruenspecht, you did a couple of different analyses. An early analysis you did showed that the result of this proposal would be to encourage more CCS deployment, as I understood it. I think the final analysis that you've given us shows that there will be very little CCS deployed.

What changed between those 2 analyses, if anything? Was it some facts that changed or some change in the policy that we were talking about proposing?

Mr. GRUENSPECHT. Yes, thank you. I think it's really a variety of factors that are going on.

First of all, in the study we did for you late last year, I think we looked at a wide range of different policies. It was only in some specific cases that you saw significant amounts of CCS. So there were many of the cases we looked at you did not see a lot of CCS.

In this particular legislative proposal you have an alternative compliance payment. You have—trying to think of the different key factors. There's an alternative compliance payment which limits costs to, you know, rate payers. You have the small utility or small

retailer exemption which, again, tends to relax the impact of the program a little bit.

So part of it is, sort of, the specifics of the policy that we're looking at in this analysis. Some of it is also the fact that as we move forward with our Annual Energy Outlook reference cases.

For instance we have higher coal prices projected in this year's baseline than we had in last year's baseline.

We have lower natural gas prices projected in this year's baseline than in last year's baseline.

So I would say it's a combination of factors that are driving this result. Some related to policy. Some related to the underlying, you know, features of the baseline case.

The CHAIRMAN. Thank you very much.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

I want to continue on the questioning of the cost and how this all works out because I think this is where the consuming public is coming from. If this is going to save me money, let's talk about it. If it's not, let's not talk about it.

Last month the DOE Inspector General released this audit. This is directed to you, Secretary Sandalow. The audit was designed to look at the efforts to comply with the RES that was contained in EPACT 2005.

As we look at those requirements there's some analogy there with the CES that we're considering today. But I think clearly less demanding than what we have in Senator Bingaman's bill. The EPACT requires the Federal Government purchase only 7 1/2 percent of its electricity from renewable resources by 2013, allowed for 8 years of full compliance.

By contrast the proposed CES we're looking at now requires 24 percent by 2015, so essentially 3 years from now. What this audit showed is somewhat interesting that in order to meet the EPACT requirements the Department of Energy paid some pretty exorbitant prices, premiums for the electricity. In one case, this is at Oak Ridge National Lab. It's my understanding that the cost per megawatt hour was \$26.67 per megawatt hour, more than 20 times more than what other DOE installations were paying.

So I guess the question is is given what we know, given what this audit has demonstrated, with a compliance that is or requirements that are less rigorous than is proposed in Senator Bingaman's legislation here, shouldn't we expect the utilities to pay much higher prices for a requirement that is 3 times higher with only 3 years to comply?

If that's the case, aren't we going to then see those costs passed on to the consumer?

Mr. SANDALOW. Thank you for the question, Senator Murkowski.

It's important when that highlights a very fundamental aspect of the Clean Energy Standard that we're here to talk about today. As you say the requirements at issue in the report that you cited is the requirement in the 2005 Energy Policy Act that Federal agencies buy 7 and a half percent of their energy from renewable sources by 2013. The Department of Energy takes that obligation extremely seriously, working, obviously, very hard to meet it and in fact met it ahead of schedule.

That legislation which was signed by President Bush in 2005 includes a specific requirement to buy renewable energy. The Clean Energy Standard before us today imposes a requirement to buy energy from any type of clean source, not just renewable sources, but also nuclear or efficient natural gas or clean coal. So it broadens the opportunities for any regulated entity to buy clean power. It's that technology neutral aspect of the Clean Energy Standard which is, in the eyes of many observers, I think and certainly in ours, it's that aspect that's so compelling.

The Clean Energy Standard is technology neutral. It gives a price signal to the market. Then let's the market decide how best to meet it.

Senator MURKOWSKI. Then let me ask the question.

Because Dr. Gruenspecht, you've indicated that there's a couple complicating factors here, the nuclear portion of the CES requirement and the fact that you rely so much on nuclear as part of this portfolio and a recognition there that that might not be achievable. On the coal side that too, may not be achievable. You've indicated that you're going to—you anticipate a substantial decline.

So for instance, just on the nuclear alone according to your analysis, we're going to need 82 gigawatts of new, nuclear capacity would be needed by 2035 and this is compared to just the ten gigawatts in the reference case. That's an 82,000 megawatt differential there.

So I understand what you're saying, Mr. Secretary. But I also appreciate that what we're talking about might not be achievable. So it might look good on paper, but how do we get there from here?

I'll throw it out to both of you.

I'm assuming Dr. Gruenspecht, that with the nuclear you've indicated that this could be a complicating factor.

Mr. GRUENSPECHT. I mean, and that's why we ran—although again, one thing we tried to do is make our report shorter and not as encyclopedic as it might have been in the past. But we did run this, you know, what we call a sensitivity case without nuclear above the reference case. You know, there we got a lot more, significantly less nuclear obviously, without, you know, 72 less gigawatts of new construction.

But we got a lot more non-hydro renewables coming in backed by gas because clearly nuclear is a base load technology and the renewables, many of them are intermittent technologies. So, you know, we lost something like 580 billion kilowatt hours of nuclear generation in 2035 relative to, again, this, you know, rapid nuclear broad case. But we gained 300 billion kilowatt hours of non hydro renewables, 160 billion kilowatt hours of gas and 100 billion kilowatt hours of coal to kind of make it up. The costs were a little bit higher, but not much higher.

So you know, again, we don't take a policy position. But the point is yes, this kind of program does raise the cost of electricity. Obviously you're taking your existing plants that are already paid for and, you know, causing them, in some sense, forcing them out of the market to a significant extent.

That's reality of what this proposal does. That's what it's intended to do and replacing it with something else. You know, we

think that nuclear is the cheapest something else, but not by a very large margin.

So if the nuclear something else doesn't come to fruition there are other something elses that come into play to, you know, to meet the standard. Now if all of the something elses can't come to fruition then you really do have a major problem.

Mr. SANDALOW. If I might just briefly add, Mr. Chairman.

Senator, you asked how do we make this happen? How do we bring these clean energy technologies online? I say let's work together to make it happen.

I know that the President believes in the innovative spirit of the American people and American know how, ingenuity, manufacturing capabilities. Working together there is no challenge that we can't meet. These are exactly the type of challenges we've met in the past. We can do this.

Senator MURKOWSKI. My time is expired.

But I will just point out that since 1977 we've only added 5,000 megawatts of nuclear capacity in this country. If we're looking to CCS, you've already indicated that we're not going to be seeing that happen. It would appear to me that it's all on the back of natural gas cause we're not moving the solar and the wind dial up that rapidly.

My time is well over, Mr. Chairman. I'm sorry.

The CHAIRMAN. Not a problem.

Senator Udall.

Senator UDALL. Thank you, Mr. Chairman.

Thank you to the Ranking Member and yourself for holding this important hearing.

Gentlemen, good morning.

I think Senator Murkowski is asking some very important questions. I would add that I believe it's important we I look at the short term costs of transitioning to a clean energy economy, bt also the medium and the long term costs if we don't.

There are, the direct costs that we're talking about here today. but there are indirect costs. There are also externalities that you can link to our national security efforts, whether it's protecting oil supply lines all over the world or the effect of carbon pollution on our climate.

With that let me just say that I think this bill would be a step in the right direction. I also want to emphasize that I still support, as I know many of my colleagues do, a renewable electricity standard nationally. We've had great success in the State of Colorado with the renewable electricity standard.

I would argue in fact we felt less the effect of this great recession because of our energy sector's capacity to innovate, create jobs and provide power that's less and less expensive. We all know for example, wind now competes directly with coal. Some would argue it's actually cheaper than coal.

I hope we can take a close look at this legislation because it would provide market signals and certainty to businesses, innovators and consumers directed at new and clean energy technologies. I don't want to be too much of a booster for my home State. But I really do believe Colorado presents a great example of

what could be if we, nationally, embraced something like a Clean Energy Standard.

Let me turn to the 2 of you and ask you how you would foresee a national CES helping American businesses compete and lead in the clean energy sector. Why do we need a CES? Maybe I'll start with you, Mr. Secretary and then turn to the good Doctor.

Mr. SANDALOW. Thank you, Senator Udall.

The point you make is really fundamental here that a Clean Energy Standard provides the long term signals that businesses tell us they need to bring capital off the sidelines. As I go talk to the business community I know one of the comments that I hear more often than any other is if government would just give us the clear signals over the long term. That's what we need.

A Clean Energy Standard, one that sets a clear pathway for several decades, would bring not just capital, but American ingenuity, American know how to the table. It would allow us to succeed in the global race for clean energy.

I tell you I've traveled a lot in the last couple of years talking to other countries about what they're doing in clean energy. The race is on. There's a lot of investment going around the world on this. I think we need and the President and Secretary, too believe, we need a long term framework. That's what the Clean Energy Standard provides.

Senator UDALL. Could you make the case that Europe, China, India, all in effect have their own Clean Energy Standards?

Mr. SANDALOW. Different countries have different policies, Senator. There's a range of different approaches around the world. But, you know, in China, in Germany, in other countries, the investment in this area is considerable. Government is partnering with businesses in those countries making sure that their businesses succeed in this global race.

It's a challenge to us. It's one I know we can meet. A tool like the Clean Energy Standard will let us do it.

Senator UDALL. Doctor.

Mr. GRUENSPECHT. Yes, I don't have that much to add on that. I would say one thing. You know, in the United States the rate of growth of electricity demand, you know, has come down a great deal. So like, when I was a child, you know, the demand was growing 8, 9 percent a year which meant that load was doubling every 8 or 9 years.

So you needed a lot of new generation of some type to meet growing demand. You know, in part because of our maturity, in part because of some of the policies that have been enacted, you know, we are not looking to very rapid demand growth in the United States. So in the United States a lot of these technologies, if they're going to be used here, will have to—will be replacing existing technology.

In China, in India, that's much more like the United States was when I was a kid. You know, electricity demand growing ten, twelve percent a year. So they need new capacity of one kind or another to meet growing demand.

I think in general some of these, you know, if you need new something then I think the clean energy technologies, you know, have much more potential to be competitive with old technologies than they have with the situation where the new clean energy

technologies are competing with old technologies that are already in place. You know, whose capital cost has already been incurred.

So again, the issues of the externalities raise, I certainly understand that issue. But on a straight, you know, sort of economic cost of electricity basis. I'm not saying that those policy considerations should be ignored. That's up to, you know, my friend, David and you, not me.

But I can tell you that the opportunity for clean energy is inherently going to be much greater in an environment where there's a tremendous growth in load than in an environment like we have where there's very modest growth in the load.

Senator UDALL. I note the clock has given me more time than I think was my due. So let me end with a comment.

I want to thank the Chairman for including a study on biomass. I know my colleague from New Hampshire sitting to my right, Senator Shaheen, is very interested in biomass. For the record I would welcome your comments on how we might include biomass in a Clean Energy Standard.

Then also we have considered how you measure efficiency gains which speaks, Doctor, to what you were just talking about as well and if it's possible to put efficiency into a Clean Energy Standard or are there other mechanisms to drive signals into the market.

But again, thank you for your thoughts on this and Mr. Chairman, thank you for holding this hearing.

The CHAIRMAN. Thank you very much.

Senator Barrasso.

Senator BARRASSO. Thank you very much, Mr. Chairman.

I noted in the Chairman's opening remarks he commented that one of the goals here is to keep America competitive in the global clean energy economy. Those of us from the Rocky Mountain West have concerns. We want to just keep America competitive in the world. We think that's not happening under this Administration in many of the regulations and rules and burdensome and expensive and time consuming red tape that is being applied by this Administration to the real job creators in this country.

Now, Mr. Secretary, when I take a look at this legislation, the purpose of which is to reduce carbon emissions from electric utilities, but the Administration has already issued regulations designed to reduce carbon emissions from utilities.

So the question is if Congress adopts this legislation would the Administration then turn around and repeal the regulations that were designed to reduce carbon emissions from utilities?

Mr. SANDALOW. Senator, thank you for the question.

I think you're referring to Clean Air Act regulations. The Clean Air Act has a 40 year history of protecting public health in this country, of keeping the air clean, improving the quality of life and I would add of increasing GDP in this country.

Senator BARRASSO. The question, I mean the question gets down to the Administration repeatedly in 2009, 2010 and you're part of the Administration, said that Congress had to pass a cap and trade bill so that the EPA wouldn't have to issue regulations to reduce carbon emissions. To pass this where we're going to do that?

So if I'm looking for one question today from this Administration, this is the question. You know, is the Administration willing to re-

peal these regulations instead of just wrapping the country up in additional red tape by this piece of legislation?

Mr. SANDALOW. Senator, the Clean Air Act has delivered enormous benefits to the American people over 40 years. We are——

Senator BARRASSO. So the answer yes or no?

Mr. SANDALOW. We're not looking to amend the Clean Air Act.

Senator BARRASSO. So your goal is if you would put this on top of all the excessive regulations and we can use whether the phrase excessive is the right or wrong one. I believe it is the right one. So this would be on top, piled on top, of what the job creators are facing today?

Thank you.

Scientific American ran a study Monday entitled, "Asian Demand Forecast Boom for Coal." You keep talking about and the Administration talks about what's going on around the world and China leading the way. They're going to widen the gap with the United States as the world's largest coal producing country by the end of the decade. By 2020 China will produce 4 and a half billion metric tons of coal annually, it says, reflecting a 3.5 percent compound annual growth rate over the next 8 years.

It goes on to say that Asian forecasts contrast sharply to projections for the United States which is expected to see sagging demand as power plants undergo fuel switching. The article explains that China's coal will be used to meet demand in its electric power and steel making sectors. So if Congress adopts legislation which increases electricity costs by as much as 30 percent how are we going to be able to compete economically with China?

Mr. SANDALOW. That wouldn't be legislation on the Clean Energy Standard, Senator. This is legislation that we can enact while keeping prices low while ensuring equity among regions and while promoting technological innovation.

I'm not familiar with the article that you just cited. But it may be that in part the numbers that you're repeating have something to do with what Dr. Gruenspecht was talking about, the growth in the Chinese economy.

Senator BARRASSO. The additional expense of energy in the United States under additional rules and regulations.

Mr. Secretary, EPA's endangerment findings says 6 greenhouse gases endanger both the public health and the public welfare of current and future generations. Now I assume you agree with that statement. Going through your book and other things.

I'd like to share with you what are the health impacts of unemployment cause we're considering legislation that will effectively shut down American coal plants, coal mines, increase electricity rates an average of 18 percent, as much as 30 percent. With higher electricity rates businesses will have less money to invest and to create jobs. So on Sunday the New York Times ran an Op Ed. It is called the "Human Disaster of Unemployment."

The "Human Disaster of Unemployment" and we have long term, chronic unemployment in this country now that's impacting families all across the country. The article says that the unemployment, that unemployment, chronic unemployment causes a 50 to 100 percent increase in the death rate for older male workers in the years following loss of a job.

The reasons for this include increase in suicide rate by actually by 4 additional suicides a day in the United States as a result of this.

Twenty-five percent increase, higher risk of dying from cancer.

It also explains that unemployment leads to a higher probability of divorce. Eighteen percent increase when a husband loses his job. A 13 percent increase when a wife loses her job.

I mean, it is an article that I would recommend that the White House takes seriously into consideration and have thoughts about the impact of the regulations as well as legislation when they lose jobs in the effort to, I think as you've said, lead the world in clean energy.

So thank you, Mr. Chairman. My time is expired.

The CHAIRMAN. Did either of the witnesses want to respond? If not, we'll go to the next question.

Mr. SANDALOW. Thank you, Mr. Chairman.

Let me just say that, Senator Barrasso, I grew up in the great State of Michigan. That's a State that's been plagued by unemployment over a number of decades. So the human toll of unemployment is terrible, as you say.

Let's make sure that we are bringing capital off the sidelines for investing in our energy economy.

Let's position the United States to win the energy race of the future.

That's exactly what a Clean Energy Standard can do.

Thank you.

The CHAIRMAN. Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman.

I want to thank both our witnesses who've come this morning.

Gentlemen, I support the basic proposition of Senator Bingaman's legislation. I think it's going to give new momentum to the effort to promote clean energy in this country. I'm a co-sponsor of the bill.

At the same time I think my colleagues have raised some important issues on the proposition of does all the wisdom come from Washington, DC through various edicts? I share the concern with respect to energy pricing.

Secretary Sandalow, you, to your credit, make an important point with respect to regional differences. It's on page 5 of your testimony which is why I want to ask you about another idea. Since I haven't talked to the President about it or the Secretary, I just want you to use it for purposes this morning of something that you all would think about.

If you want to make some preliminary remarks, you can. Then perhaps get back to me.

My sense is that there would be an opportunity, for example, to create a State waiver kind of process. So that you could say that if a State hit the target they would have freedom, in effect, at the State level to go out and pursue approaches that would make sense for them. If they, for example, could offset utility emissions with reductions and emissions from say, steel mills or emissions from oil refineries, they would be in a position to do it.

In other words, we know that we have the assurance with respect to making national progress with respect to clean energy. But

we'd also, to some extent, liberate the States and address this question that you have on page 5 with respect to the regional differences.

So, as I said, I haven't talked about it with the Administration. You're getting this cold. I did speak to the State utility regulators recently. The reaction was pretty positive.

My sense is we're moving in this direction, with your comments. Chairman Bingaman makes an important contribution with respect to trying to deal with small utilities. I think everybody is trying to find a way to promote clean energy, nationally. At the same time address some of these flexibility issues.

Do you have any, kind of, preliminary thoughts recognizing you're getting it cold? There's no Administration, you know, position on it. I think for all practical purposes the Administration is hearing about it for the, you know, first time.

But I can tell you in my State where we, as you know, really have green energy in our chromosomes. We would like to find ways to have this kind of flexibility. So any preliminary thoughts on this?

Mr. SANDALOW. Thank you, Senator.

I'm hearing about it for the first time. I've learned as a job preservation technique never to comment right off the bat on something like this.

Senator WYDEN. Always wise.

Mr. SANDALOW. But I thank you very much for the suggestion. It's one we'll look at very closely.

But it raises the broader issue of regional fairness and ensuring that all regions participate in this. As we've been looking at this Clean Energy Standard one of the conclusions that leaps out for me is how clean energy resources are distributed across our country, that every region of the country has different ways that they can participate in a Clean Energy Standard like this.

So, you know, obviously in your region there's hydro power. There's biomass. There's more.

It's just striking how every region of the country can participate in different ways in this. So your proposal is one that we'll look at very closely as we move forward.

Senator WYDEN. Understand this is not something I've even crystallized in terms of something I would even offer as an amendment, you know, tomorrow. What I know is particularly in the West and a lot of parts of the country that are a long way from, you know, Washington, DC. I think this is reflected in some of my colleagues, you know, questions this morning.

You know, the concern about pricing. People think that they're getting, you know, hit over the head with a 2 by 4 on energy prices today is a hugely important issue. You've acknowledged that. I mean, in effect, economic growth and affordable energy are 2 sides of the same coin.

It would just seem to me that if we can find a way to advance a national agenda for clean energy. Chairman Bingaman has put a lot of work into this and a lot of good work. At the same time find a way to acknowledge these, you know, regional, you know, differences.

People aren't going to be given a free ride to go do whatever they want. They would have to, in effect, show that they're hitting these targets. But we recognize that perhaps what works in Coos Bay, Oregon and a small utility wouldn't necessarily be the same sort of thing you'd do in Miami.

So I look forward to continuing this discussion. I appreciate the good work and Chairman Bingaman for all the leadership you've put into this issue. I want you to know I'm going to continue working with you on this.

The CHAIRMAN. Thank you very much.

Senator Corker.

Senator CORKER. Mr. Chairman, good to be back.

The CHAIRMAN. We're glad to have you back.

Senator CORKER. You continue to nibble at this. I appreciate—I respect your tenacity. I appreciate the testimony of the witnesses.

Dr. Gruenspecht, I noticed you didn't think there was much uptake in the future on carbon capture and sequestration. I've always thought it was a pretty hokey idea. It was kind of one of those things when donkeys fly we'll have pipes running everywhere, piping excess carbon. It seems to me that you share the same thoughts.

Mr. GRUENSPECHT. I don't think I shared that exact same thought.

[Laughter.]

Mr. GRUENSPECHT. Maybe we got to the same point by different means or something.

Senator CORKER. So the point is that CCS, I know we've had a lot of evolutions here. This is really a pipe dream unless you have a coal facility right beside an oil well, which they're usually not located next to each other. It's probably not that useful.

So it looks to me like a more transparent way of talking about coal when we start looking at Clean Energy Standards would be to say that by a certain date coal is just not going to be a part of our energy mix in this country if you look at these formulas. We might as well say that to the places in Appalachia and Wyoming and other parts of this country, you need to be planning on a very different future.

Would you respond?

Mr. GRUENSPECHT. Me?

Senator CORKER. Yes.

Mr. GRUENSPECHT. You know, I think the modeling results, which again, you know, as the first Administrator of the EIA said something like there are no facts about the future which is certainly true. But in our modeling results the use of coal, you know, is reduced pretty significantly.

Senator CORKER. Yes.

Mr. GRUENSPECHT. I mean and that's—I don't think anyone looking at the legislation not running a model would have expected anything else.

Senator CORKER. No, I agree with that.

So let me ask you this question. The energy policy is actually pretty interesting to me. I look at our country and then I look at the way sort of companies operate and companies look at the strengths that they have. They try to build upon those.

We continually have this phobia about China because for some reason they continue to focus on their strengths and the weaknesses that they have they try to overcome by creating alliances in other parts of the world. To build a little bit on Senator Wyden's comments I mean, we have tremendous strengths in this Nation that allow us to be competitive over the long haul and instead of just focusing on one industry which would be clean energy as is discussed today.

Do you think when we look at these kind of policies that we are taking a proper inventory of our country's strengths as it relates to energy and deploying them fully to make sure that everything in America is competitive or do you think when we look at policies like this we end up really moving away from the great strengths this Nation has as it relates to its resources?

Yes, sir.

Mr. GRUENSPECHT. Me, again?

Senator CORKER. Yes and that's all you this time.

Mr. GRUENSPECHT. How unfortunate for me.

[Laughter.]

Mr. GRUENSPECHT. Yes, you know, those are very broad questions that go beyond, in some sense, what my role is, you know, at the—although I am an economist. I do have views. But—

Senator CORKER. You're welcome to share your views.

Mr. GRUENSPECHT. Yes, I know I'm welcome to, but I'm an older—it was one of the, I think, Senator Barrasso said something about older male workers and unemployment. So I want to be very careful.

[Laughter.]

Senator CORKER. I think in essence the witness agrees with me. Let me, since he does.

[Laughter.]

Mr. GRUENSPECHT. I did not. I did not say that. What a minute. Come on.

[Laughter.]

Senator CORKER. I think he is saying that.

So let me just move to my final point. Look, you know, we really it seems like here we want to be like some other place. We talk about Germany and other places.

Yet, it seems to me that as a Nation for us to be competitive what we would do is focus on the resources and strengths that we have and fully deploy those because we have advantages over other Nations. Some other Nations, maybe if they're by the North Sea or something like that, they have advantages over us. It just seems that Washington is constantly trying to move away from the great strengths this Nation has just in order to be like somebody else in some European place. It just doesn't seem a natural or very wise thing for us to do.

I would ask that if we're going to do studies like this where we say the energy prices are going to be up 18 percent but we create this formula where that's actually going to save taxpayers money in energy which is pretty interesting to me. Because we're going to invest in energy efficiency that we might look also that if we invested in energy efficiency but yet we use the abundant energy re-

sources we had today and didn't close existing facilities where energy prices would be for Americans.

It seems to me that that would be a fair thing to look at. So let's invest in efficiencies. But let's also use these tremendous resources that we have in the Nation. My guess is the formula would come out in a very positive way for Americans, very different than what I think this is ultimately going to lead to in 2035.

But this has been great. I thank you for being here. I love my seat down here.

[Laughter.]

The CHAIRMAN. Senator Franken.

Senator FRANKEN. First of all I'd like to stipulate that both the witnesses agree with me.

[Laughter.]

Senator FRANKEN. Thank you.

[Laughter.]

Senator FRANKEN. I think our strength in this country. I think one of the strengths that we sometimes ignore is our innovation and our spirit of entrepreneurship. There are countless innovative ideas and approaches to clean energy technologies that are brewing around the country and many of them are in Minnesota.

If American entrepreneurs and inventors are to lead the world in this area we have to, as we have in the past in so many other technologies, we must bring these ideas from the laboratory to the marketplace. This is one reason why the Clean Energy Standard, I think, is an important piece of legislation. It sends a powerful signal through our country and to use our strength of innovation. Gives clean energy entrepreneurs and developers long term business certainty.

Mr. Sandalow, and I know you'll agree with me.

[Laughter.]

Senator FRANKEN. Can you describe what some of our competitors are doing in this area? Can you give us your recommendations on how we can stay competitive as a Nation and build on our strengths?

Mr. SANDALOW. I agree with you, Senator.

Senator FRANKEN. Thank you. That's enough.

[Laughter.]

Senator FRANKEN. Please answer the question.

Mr. SANDALOW. Senator, let me start by quoting my boss, Secretary Chu, who says, that we need to ensure that our technologies are invented in America, made in America and sold around the world. That's a goal here. That's what a Clean Energy Standard can help us do.

I visited China a number of times in my current position. On one of those trips I went—I was in Shanghai. I went to a 2.2 gigawatt coal plant that was using ultra super critical turbines and had pilot carbon capture onsite.

We went from there to one of the largest, if not the largest, solar manufacturing facilities in the world and from there to a state-of-the-art automotive engineering facility. In China they are investing heavily in energy technologies and in the clean energy future.

The same is true in Europe where the deployment and the innovation actually is quite significant.

The United States, for more than 2 centuries, has been a leader in technologies. It is—this is a race that we can win. It's a race that we will win with policies like the Clean Energy Standard.

Senator FRANKEN. OK, thank you.

I'm a strong supporter of a Clean Energy Standard. I do believe, however, it needs to do a better job of incorporating renewables. You know, about 90 percent of our electricity today is used generating coal, natural gas and nuclear energy and obviously natural gas, nuclear energy and coal with the donkey flying, carbon sequestration could be part of a Clean Energy Standard.

But I think it's clear that renewable energy needs to be a bigger part of this mix. In Minnesota we were the—we had the most aggressive renewable energy standard at a certain point to do 25 percent renewable energy in our utilities by 2025. We're exceeding it. We're ahead of it.

I believe that we should carve out a renewable energy standard within the Clean Energy Standard. I was wondering what your feelings are about this. This could be with either Dr. Gruenspecht or with Mr. Sandalow.

Mr. GRUENSPECHT. Senator, there's no question there's been extraordinary progress in renewable energy technologies over the course of the past several years.

We've seen wind power prices come down in the past decade or 2 to levels that it's now competitive with other, you know, generation sources.

In many parts of the country solar PV prices have dropped dramatically in the course of just the past couple of years. State RPS policies or the type that you cite have been an important factor and very successful in a number of instances.

This proposal for a Clean Energy Standard is designed to be technology neutral to give utilities and other entities the choice between different types of clean energy technologies in meeting their obligations. That's one of the President's principles under the Clean Energy Standard is a technology neutral choice between different energy technologies.

Senator FRANKEN. I would suggest that a renewable energy standard could be carved out in this and be a piece of it. That that would be something that we, as a committee, should consider in ways that Congress should consider.

Thank you, gentlemen for agreeing with everything I said.

[Laughter.]

The CHAIRMAN. Senator Risch.

Senator RISCH. Thank you, Mr. Chairman. I appreciate that. Appreciate you holding the hearing.

I have to say I'm shocked this morning to hear what the recommendations from my seat mate, Senator Barrasso. He's never before recommended that I read the New York Times. So I don't know, maybe he's becoming more enlightened.

[Laughter.]

Senator RISCH. Dr. Gruenspecht, since you're in charge of the Energy Information Administration you talked about these models. Have you run a model on this particular piece of legislation? How much more and I gather you've already told us it's going to cost the American consumer more.

How much more in direct costs and indirect costs is this going to cost the American consumer?

Mr. GRUENSPECHT. Thank you for the question.

I don't think I have that on the top of my head. To be honest with you, I think that, you know, electricity bills will be higher.

Senator RISCH. Not only the direct costs, but also the indirect costs that American consumers pay in every service and every commodity that they buy. It's got to be higher. Am I right on that?

Mr. GRUENSPECHT. Again, I think electricity in all sectors is—the 18 percent is average across all users. Electricity is about, the last time I looked, is about a third, a third, a third, industrial, residential and commercial.

Senator RISCH. But the number you gave was without this piece of legislation.

Mr. GRUENSPECHT. Actually what I—the 18 percent is this piece of legislation in 2035. So there's very little effect on prices over the next decade. Then in the middle of the next decade you start to see a divergence between the baseline without this legislation and the case with this legislation.

Senator RISCH. Mr. Sandalow, let me turn to you for a minute. First of all let me say that I share with you the absolute optimism that the American people can do this.

Let me tell you where we part ways. I have absolute confidence in the American people. I have zero confidence in the government.

This Administration, a Republican Administration, or any Administration to make these innovations work to encourage the American people to be innovators. You noted, correctly, that for 2 centuries America has led in technology innovation. You also observed that we're falling behind.

I would point out and I would urge that the reason we're falling behind is just what Senator Barrasso so eloquently pointed out. That is the heavy, heavy, hand of the government and the shackles of government regulation that hold innovators back, who want to produce, who want to create, who want to increase our quality of life.

This government and if you look around you, almost every enterprise of this government, doesn't meet the standards, doesn't meet the dream of the American people. The more the government gets involved and they get involved every day more and more. It seems like the further backward we go.

If you don't believe that just look at these statistics about what the American people think of its government.

Thank you very much, Mr. Chairman.

Mr. SANDALOW. Mr.?

The CHAIRMAN. Did you want any response from that?

Senator RISCH. I did not.

The CHAIRMAN. You do not want a response?

Alright.

[Laughter.]

The CHAIRMAN. I guess that's a fair question. We will assume that they disagree with whatever you said.

[Laughter.]

The CHAIRMAN. Next—

Senator RISCH. Mr. Chairman, I think that's a fair assumption.

[Laughter.]

The CHAIRMAN. Our next witness—our next questioner is Senator Coons.

Senator COONS. Thank you, Chairman Bingaman.

Thank you for convening this hearing and thank you for your leadership and for the way you've conducted this committee. To you and to Senator Murkowski for continuing to work forward on these important issues.

Senator Risch and I have a slightly different view of the, I think you characterized it as shackles and heavy handedness of the Federal Government. I can see how some can disagree over the impact of regulations. But I'll simply point to over 2 centuries of American experience where there are many different examples where Federal investment helped drive forward the adoption of new technologies, the creation of new markets and our leading global position. From intellectual property protection to tax trade, immigration, research and development, Federal investment, Federal supports, Federal standards have played a critical role.

So, let me get to the question if I can at hand, sir.

Looking for something that might be helpful. There are, of course, critics, both here and nationally who have some real issues with a Clean Energy Standard calling it another unnecessary Federal Government intrusion and a drag on the economy. CAFE Standards for automobiles, fuel efficiency standards for car and truck fleets were debated vigorously for more than 20 years before there was any real progress to increase minimum vehicle standards starting with model year 2011.

Phase 2 requirements are now being developed for the next round, 2017–2025. I think there have been clear benefits for innovation, jobs, economic transformation because of a long term market signal.

Is it valuable to look at CAFE Standards as another place where a clear market signal made a fundamental difference?

I see an American auto economy today where employment has stabilized.

Where they've had record years.

Where they're selling models that are competitive, domestically and globally.

I'd be interested in both of your comments, but particularly if I might, Mr. Sandalow, on whether or not CAFE Standards have demonstrated recently the impact, the positive impact, of a Federal regulatory standard?

Mr. SANDALOW. Yes, they are, Senator Coons. Thank you for your question. Your question is particularly meaningful to me because, as I said earlier, I grew up in the great State of Michigan. That's the State that's been plagued by unemployment over the years.

When I go back today I see a sense of optimism and hope there that's the result of the President's policies to save the auto industry. It's the result of the clear, long term signals that new fuel efficiency standards provide starting to transition the American auto industry toward technologies of the future. It's exactly the type of clear, long term signals like that that make a big difference.

If I could just add, thank you for your eloquent statement about the Federal Government and the Federal role. I would just add.

Senator COONS. Feel free to expand.

Mr. SANDALOW. Thank you, Senator.

I would just add it is the American system of government is one of the great contributions of our people to mankind.

It is the American government that funded the research that led to the Internet.

It's the Federal Government that funded the research that led to GPS systems.

The Federal Government that funded the large scale deployment that led to commercial aviation.

Just in my Department, long before I arrived, we started administering a program for appliance efficiency standards. Those standards are saving American families and businesses \$15 billion a year.

So the Federal Government plays a central role in promoting innovation and in saving American families money, in particular in the area of energy.

Senator COONS. Thank you, Mr. Sandalow.

I do think there are legitimate questions and concerns raised about regulatory impact. We do owe it to our constituents to make sure that regulations, when imposed, are reasonably targeted, achieve the affect that they are designed to achieve and that they are efficient. They need to be reconsidered at times, but I do think that's another good case.

Energy efficiency standards, we've demonstrated in previous hearings and discussions on this committee have actually incentivized new plants, new investment, new R and D, new products, new hiring rather than the counter case which has been made by many others.

Dr. Gruenspecht, would you like to add to this conversation?

Mr. GRUENSPECHT. Yes. I'm not from Michigan. But I did write a thesis that had something to do with the automobile industry.

I would say one difference, you know, again, it doesn't make it good or bad because we don't take positions on policy. But CAF, you know, has to do with, sort of, what an appliance standards have to do with what the new vehicle, you know, what would be the characteristics of new vehicles. There's nothing in the CAF program or in the appliance efficiency program that says effectively we're going to set up a program where you must get rid of your existing vehicle or you must get rid of your old refrigerator.

It might be a very good idea. You might save a lot of money by getting rid of your old refrigerator.

This Clean Energy Standard, I think, I mean, it's not about what the new build is going to be because we have very little coal frankly in our new build anyway given gas prices and a host of other things. The Clean Energy Standard would essentially, works by displacing, you know, the existing capacity that doesn't meet its standard. So in that sense it is somewhat different than appliance efficiency standards or CAFstandards that focus on, you know, if you're going to buy a new car, a new refrigerator, this is how it needs to be.

So that's just to make a fair observation. You know, there are some similarities, but there are some pretty significant differences.

Senator COONS. But wouldn't you agree a critical difference is that this is not—this is providing market based incentives over the long term for that future mix of energy generation rather than mandating that any new generation capacity hit certain targets.

Mr. GRUENSPECHT. I think what it's saying is it's a, I mean, indirectly I think it is a mandate to displace existing generating capacity that meets a lot of the Nation's electricity load. I mean the coal share of generation has fallen from 50 percent right now to well below 40 percent. Because with natural gas prices low as they are you find that in many cases it's cheaper to dispatch, again without regard to emissions or anything else, just in the straight dollars and cents, many areas of the country the gas plants will run ahead of the coal plants.

But it is, you know, it is a little bit of a different thing to say you must stop using, you know, some of the capacity that you're using today. I mean, it's not the same thing in my mind as the CAF standard or the Appliance Efficiency Standard. But that's just an observation. That's not saying it's a good thing to do or a bad thing to do. It's saying that it's just inherently a different kind of proposal.

Senator COONS. I see I've exceeded my time. Thank you.

The CHAIRMAN. Thank you.

Senator MANCHIN. Thank you, Mr. Chairman. Thank you all for being here today.

We've heard a lot of discussion back and forth. I think what we're trying to find is a balance. I think the frustration that Senator Risch is that basically it's hard for government to find that balance sometime. I mean, you start moving the market in a way the market is not ready to go.

My concern would be this in competing with our economic challengers from China and industrial worlds that are—countries that are developing and that we're competing with on daily. They have an all in policy that they don't really try to move the market or change the market because of policy. They basically believe that clean energy and if they're going to invest in that. But they don't basically decimate their base load.

They're still using their coal. They're still using their natural gases. They're still trying to develop the energy for the future.

We seem to be automatically picking one over the other. When I say that I know what is in my State of West Virginia. We have as much wind, if not more wind than most anybody east of the Mississippi. People don't know that. They think we're all a fossil State.

We do everything we can with hydro. We have given the energy of this Nation has needed to defend itself, to build the industrial might and defend itself in every war we've been in with coal, the natural gas and oil. Now we have the Marcellus shale.

We have a chance for a Renaissance, a Renaissance of manufacturing again because of the wetness of the Marcellus shale. We have a chance to change in transportation fuel. But we're not dismantling our coal.

But yet this government seems to be, our own government, is something that we're fighting with continuously trying to find a balance. I think that's the frustration that the Senator showed. It's the balance my good Senator here wants to find.

But that's all we're saying is that coal—what you've done and what you're planning to do. If you look at China, China is going to triple. They will triple in the next 3 decades their demand for coal.

Unless we believe the world is flat. That we quit burning any fossil in the United States of America. That's going to clean up the atmosphere. Then we would believe the world is flat.

It seems to me to find the technology that really helps, that we can go out and clean up the atmosphere around the world would be the way to do it. But not—we don't see it. We have the FutureGen in the present State of Illinois. It's still moving forward. He wants that very much.

But yet in West Virginia we've already done commercialization. We could have done a total Mountaineer power plant. Couldn't get the Department of Energy to buy into it.

They made other investments elsewhere that didn't work out as well. We could have had a total commercialization. Proving it could be done.

We're just saying take an all in policy because if you go down the road, we've been down the road. We have natural gas and coal. So we've been blessed. We have wind. We've got it all.

We know when the prices were at \$2 an MCF, two fifty and MCF, right now as they are, low prices of gas. People are going back to the peaking, their net peaking stations before gas jumped to \$10 and \$12 and \$13 an MCF. They shut them all down.

But we had competition back and forth. If we take an all in policy and we discard whether it be coal or gas or whatever. You're putting all your eggs in one basket. I think that is a formula for disaster.

Until we develop the fuels of the future you've got to use what you have. What I'm saying is we'll be the first Nation in history not to use its resources to its own benefit, to all of its resources. I've tried to explain this to people.

Do you know that most of our coal is being bought by foreign countries?

Do you know that our coal mines, the ownership of this resource is being bought by foreign countries? They're not using it here. They're mining it because it's here. But they're taking it elsewhere. That's not going to stop.

All I'm saying is we've got to find the balance. In West Virginia we're asking for you all in these polices here. You're rooting out the one abundant energy that you have.

You've had. It's been stable in pricing. It's affordable, dependable and reliable.

We're happy to supply the gas and God bless us we have it. But we have the coal too. That's what we're asking. Can you all find that balance?

Mr. SANDALOW. Thank you for that, Senator. Two points in response.

First, a Clean Energy Standard is designed, precisely, to bring in the diverse energy sources that you just pointed to in West Virginia. It's designed to bring in coal with clean coal technology.

It's designed to bring in—

Senator MANCHIN. It's not in this energy—this bill.

Mr. SANDALOW. Senator, a Clean Energy Standard is technology neutral.

So West Virginia wind.

West Virginia hydro.

West Virginia natural gas.

West Virginia coal.

Can all come in under a Clean Energy Standard.

I'm going to respectfully disagree with Senator Corker, with his points about carbon capture and storage technologies. I think there's tremendous potential there. That's why the Department of Energy is investing in that technology. It's why—

Senator MANCHIN. Where.

Mr. SANDALOW. Around the country, Senator.

Senator MANCHIN. Not around our country. Not around our State. We've got more than anybody. We begged you all to complete—commercialize Mountaineer plant and we couldn't get it.

Mr. SANDALOW. I don't want to comment on that particular project, which you know, Senator.

Senator MANCHIN. We'll talk about it in private conversation.

Mr. SANDALOW. It implies a lot of ins and outs. But I—clean coal is a fundamental part of how to meet a Clean Energy Standard.

Related to that let me highlight a second point broadly about coal. Because, as you emphasized, coal is a central part of our energy mix today. Coal is going to be a central part of our energy mix in the future.

That's one reason that this Administration has invested more money than any is promoting clean coal technologies.

Senator MANCHIN. If you don't use all of your resources. Try to keep your prices competitive with the world energy prices then we're going to be in a tremendous disadvantage. China, who is our greatest economic challenge right now, is using everything.

They're going to have an advantage we don't have.

Mr. SANDALOW. Thank you, Senator.

I actually think we're agreeing. So maybe we could pursue this because the Clean Energy Standard is technology neutral. It's designed to bring capital off the sidelines and make sure that the United States competes with a broad range of energy sources that we have.

As you say, your State alone has this incredible range of energy sources. It's true around the country. A Clean Energy Standard would allow all those to come in and provide long term signals to the market. It would bring capital off the sidelines. Bring talent off the sidelines and promote American competitiveness.

Senator MANCHIN. My time is up. So I'd love to follow up with you on this. Maybe we'll schedule a meeting with you, OK?

Mr. SANDALOW. Look forward to that.

Thank you, sir.

The CHAIRMAN. Senator Shaheen.

Senator SHAHEEN. Thank you, Mr. Chairman. Thank you to you and Senator Murkowski for holding the hearing and for your leadership on the Clean Energy Standard.

Mr. Sandalow, I was really pleased to hear your comments just now about carbon capture because I share your enthusiasm. At the risk of weighing in on the donkeys flying debate, I think technology

offers tremendous opportunities in this area. We have a company in New Hampshire called Power Span, that's been working on this for a very long time. I'm very enthusiastic about their potential.

In fact, there's a long time before we got scrubbers on our coal burning power plants in New Hampshire where people thought that wasn't going to make any difference on pollution. Now we have scrubbers and it's helping with a lot of the pollution that's been emitted. We also have created jobs in doing that.

We have a number of companies that have created jobs and developed new technologies to address that. Companies like Thermo Fisher, again, that's making gauges to measure emissions at power plants. So I think the technology offers us tremendous opportunities in these areas.

I do want to go to an area that has been touched on. But I think really deserves more exploration. That's energy efficiency.

As I looked at the 5, sort of, President's principles for a Clean Energy Standard, I think there are at least 3, possibly 4, that energy efficiency actually covers. I was concerned that the bill, as it's written, looks at energy efficiency as an opportunity for the future.

There's a non binding report that the Secretary of Energy is asked to write. He has 3 years to do that.

But it seems to me, given what we know about energy efficiency, it's the fastest, cheapest way to address our energy needs that there is an opportunity here in the Clean Energy Standard to elevate the importance of energy efficiency. I wonder what you think if the bill language were amended to include energy efficiency technologies and the Secretary were charged with establishing national guidelines to evaluate energy efficiency savings what difference you think it might make in terms of the opportunities to move us toward cleaner energy in this country.

Mr. SANDALOW. Senator, it's certainly strongly agree about the importance of energy efficiency and the enormous opportunities that's often called the first fuel. There are remarkable opportunities to save money, for families and businesses to promote American competitiveness by cutting down energy waste, which is really what promoting energy efficiency is. Your leadership on this has really been striking, Senator. We're all grateful for that.

Senator SHAHEEN. Thank you.

Mr. SANDALOW. So thank you.

There is one way that the bill before us includes energy efficiency that's fairly important which is combined heat and power and recognizing the role of combined heat and power which is a way of producing both heat and electricity at the same time. An important opportunity for American business that could be much better tapped than it is today. This bill would help to promote it.

There are a range of complementary policies that can work very closely with the Clean Electricity Standard, Clean Energy Standard. In tandem they can achieve the results we've been talking about.

I just, in particular, I just want to highlight in this is such an important point, particularly growing out of Dr. Gruenspecht's analysis that when we look at these policies energy prices in 2035 for American households will be \$5 lower than they are today because we've been hearing talk about raising energy prices. But

under the EIA analysis energy prices will be, for American households, will be, household energy costs will be \$5 lower than they are today.

Thank you.

Senator SHAHEEN. I'm really glad you mentioned combined heat and power because I think, again, this is another area where there is tremendous opportunity and untapped potential usage that we really need to focus on and explore.

The other place that I would like to see—the other fuel that I would like to see included in this bill is thermal biomass because, again, another place that I think there is an opportunity to really improve. By improve I mean reduce our energy consumption.

So my time is up, but we'll explore with the next panel.

The CHAIRMAN. We do have a second panel and 6 witnesses there who have been very patient in waiting. I thank Mr. Sandalow, Dr. Gruenspecht, very much for your testimony. We will continue to consult with you as we move forward on these issues.

Let me call the second panel forward. I'll introduce them as they're coming forward.

First would be Dr. Karen Palmer, who is the Research Director and Senior Fellow with the Resources for the Future.

Second would be Ms. Judi Greenwald, who is Vice President of Technology and Innovation with the Center for Climate and Energy Solutions in Arlington, Virginia.

Third, Mr. Collin O'Mara, who is the Secretary of the Delaware Department of Natural Resources and Environmental Control in Dover, Delaware.

Next, Mr. Thomas Gibson, President and CEO of the American Iron and Steel Institute.

Next is Mr. Keith Trent, who is the Group Executive and President of Commercial Businesses with Duke Energy.

Finally, Mr. James Dickenson is the Managing Director and Chief Executive Officer with Jacksonville Electric Authority in Jacksonville, Florida.

I thank you all for being here. If we could have each of you take 5 minutes and summarize the main points you think we need to understand. We will include everyone's full statement in the record as if read. Then we will have some questions.

Dr. Palmer, why don't you start?

STATEMENT OF KAREN PALMER, RESEARCH DIRECTOR AND SENIOR FELLOW, RESOURCES FOR THE FUTURE

Ms. PALMER. Thank you, Chairman Bingaman and Senator Murkowski, members of the committee, for the opportunity to testify today. I am a Research Director and Senior Fellow at Resources for the Future, otherwise known as RFF. RFF neither lobbies nor takes positions on specific proposals. The views I present today are my own.

As a researcher I've studied the performance of policies and regulations to reduce emissions of greenhouse gases from the electricity sector including policies to promote renewable sources of electricity and energy efficiency. I've conducted analyses of the regional greenhouse gas initiative and California's AB32 policy. Currently I serve

on the New York ISO Advisory Council and the U.S. EPA Science Advisory Board's Environment Economics Advisory Committee.

My testimony today is based on results of modeling analysis of S. 2146 that I conducted with colleagues at RFF. I want to make 3 main points pertaining to the findings of that analysis.

First, the Clean Energy Standard leads to substantial reductions in emissions of carbon dioxide from the electricity sector with very little impact on national electricity prices for the first 10 years of the policy. Prices in some regions actually fall below baseline levels in the early years.

Second, our modeling indicates that the alternative compliance payment or ACP mechanism of the bill will be triggered in all years generating substantial revenue for States to invest in energy efficiency while at the same time reducing the share of clean energy and the carbon dioxide emission reductions from the policy.

Third, the small utilities exemption which applies to roughly 17 percent of national electricity sales initially and roughly 13 percent from 2025 on, creates a large difference in electricity price between exempt and non exempt utilities. This potential large price savings provides an incentive for groups of electricity consumers to create their own small utility an unintended consequence of the bill.

Now I want to explore each of these 3 points in a bit more detail.

First, like the modeling work done by EIA, our analysis finds that the CES leads to a 21 percent reduction in cumulative emissions of carbon dioxide from the electricity sector over the time horizon to 2035. In 2035 alone, the CES would reduce CO₂ emissions by 1.1 billion tons which is 41 percent of emissions in that year without the policy. This amounts to about 27 percent of the necessary CO₂ reductions in 2035 to be on a linear path to meeting the U.S. pledges made at Copenhagen and Cancun.

We also find that the policy has a moderate effect on average retail electricity prices during the first decade followed by a period of substantial price increases as the CES target and the ACP levels both ramp up. The lack of a noticeable initial price effect masks important differences across regions. As might be expected the regions that rely mostly on coal fired generation experience small retail price increases in the early years of the policy. While the Northeast, the Western States and Texas actually pay less for electricity with the CES than without it in the early years.

Second, the ACP provision of the bill is triggered in every year in our analysis which means that some retail utilities will make that payment instead of purchasing clean energy credits. When we analyzed a version of the policy without restricting—including an ACP we find that the clean energy credit price would be a penny higher than the ACP in 2015 and 2.4 cents higher in 2035. This means that the ACP lowers the national electricity price by 4 percent in 2035 but at the same time it reduces the environmental efficacy of the policy.

The binding ACP will prevent the share of electricity supply by clean sources from reaching the minimum requirements specified in the bill. As a result cumulative CO₂ emissions are 12 percent higher than they would be without the ACP.

In addition to helping to reduce electricity price impacts the ACP provision does create some money, 75 percent of which is slated to

be transferred back to the States for investment in energy efficiency. Over the 21 year period from 2015 through 2035, this policy generates roughly \$7.1 billion per year for energy efficiency programs. This represents a substantial increase over to the \$8.5 billion that the Consortium for Energy Efficiency estimates was budgeted for expenditures on energy efficiency programs across the U.S. and Canada in 2011.

Third, the small utility exemption means that customers of exempt utilities pay an average electricity retail price of only 5.2 cents in 2035 with the CES. While customers of non exempt utilities pay 11.6 percent—6 cents. Eliminating the small utility exemption would raise the average retail price at exempt utilities to 10.9 cents per kilowatt hour with no affect on prices to customers of non exempt utilities which represent roughly 87 percent of sales.

One potential unintended consequence of this substantial gap is that the policy creates an incentive for new small utilities to emerge. For example, groups of geographically proximate customers such as small cities or towns could decide to break away from their local utility and form their own small utility to take advantage of the lower electricity prices.

Thank you for the opportunity to testify today. I look forward to the discussion.

[The prepared statement of Ms. Palmer follows:]

PREPARED STATEMENT OF KAREN PALMER, RESEARCH DIRECTOR AND SENIOR FELLOW, RESOURCES FOR THE FUTURE

SUMMARY OF TESTIMONY

This testimony discusses the effects of the Clean Energy Standard Act of 2012 on electricity prices and on carbon dioxide (CO₂) emissions from the electricity sector. Our modeling suggests that the act will result in substantial reductions in emissions from the electricity sector, resulting in 21 percent fewer cumulative emissions by 2035. The policy has very little effect on national average electricity price for the first decade and leads to lower prices in the near term in some regions of the country. However, after 2025, national average electricity prices will increase as a result of the policy, rising to 18 percent above baseline levels by 2035. The alternative compliance payment (ACP) mechanism will be triggered in all years, generating substantial revenue for states to invest in energy efficiency, while reducing the share of clean energy and the amount of CO₂ emissions reductions compared to a CES policy without an ACP. The small utility exemption, which applies to roughly 17 percent of electricity sales initially and roughly 12.5 percent after 2025, creates a difference in electricity prices between exempt and non-exempt utilities under the policy that grows to roughly 50 percent on average by 2035. The exemption results in electricity prices at exempt utilities that are lower with the CES policy than without it for the life of the policy. This large price savings provides an incentive for groups of electricity consumers to create their own small utility, an unintended consequence of the bill.

Mr. Chairman, thank you for the opportunity to testify before the Senate Committee on Energy and Natural Resources. My name is Karen Palmer, and I am a senior fellow and research director at Resources for the Future (RFF), a 60-year-old research institution based in Washington, DC, that focuses on the economic dimensions of energy, environmental, and natural resource issues. RFF is independent and nonpartisan, and shares the results of its economic and policy analyses with environmental and business advocates, academics, government agencies and legislative staff, members of the press, and interested citizens. RFF neither lobbies nor takes positions on specific legislative or regulatory proposals. I emphasize that the views I present today are my own.

From both scholarly and practical perspectives, I have studied the performance of policies and regulations to reduce emissions of greenhouse gases from the electricity sector, including policies to promote renewable sources of electricity and energy efficiency. I have conducted analysis and modeling to support both state and

regional efforts to design climate policy, including the Regional Greenhouse Gas Initiative in the Northeast and the California carbon dioxide (CO₂) regulations under AB32. Currently, I serve on the New York State RGGI Advisory Committee, advising the New York State Energy Research and Development Authority on how to use the RGGI allowance auction revenue, and on the New York State Independent System Operator Environmental Advisory Council. Additionally, I serve on the EPA Science Advisory Board's Environmental Economics Advisory Council. Recently, with colleagues at RFF, I have conducted economic analysis of different Clean Energy Standards policy designs, including the one specified in the Clean Energy Standard Act of 2012, S. 2146.

Today I will focus on the effects of a Clean Energy Standard (CES) proposal embodied in S. 2146 on greenhouse gas emissions and electricity prices and the implications of two key features of the policy: the alternative compliance payment (ACP) and the small utility exemption.

I want to highlight four main points about the CES proposal:

- The CES as proposed in the bill will yield a substantial reduction in CO₂ emissions from the electricity sector, resulting in 21 percent fewer cumulative emissions by 2035 and 41 percent fewer emissions in 2035 alone.
- The CES will have very modest effects on national average electricity price through 2025 and lead to lower prices in the near term in some regions of the country. However, after 2025, national average electricity prices will increase as a result of the CES policy, rising to 18 percent above baseline levels by 2035.
- The alternative compliance payment mechanism will be triggered in all years, generating substantial revenue for states to invest in energy efficiency, while reducing the share of clean energy and the amount of CO₂ emissions reductions compared to a CES policy without an alternative compliance payment.
- The small utility exemption, which applies to roughly 17 percent of electricity sales initially and roughly 12.5 percent after 2025, creates a difference in electricity prices between exempt and non-exempt utilities under the policy that grows to close to 50 percent on average by 2035. And, the exemption results in electricity prices at exempt utilities that are lower with the CES policy than without it for the life of the policy. This large price savings provides an incentive for groups of electricity consumers to create their own small utility, an unintended consequence of the bill.

A Summary of the Bill

A clean energy standard is similar to a renewable portfolio standard in that it sets a floor on the share of electricity sales that must come from clean sources of generation, and then raises the floor over time as a way to squeeze CO₂ emissions out of the electricity sector. S. 2146 sets the clean energy requirement at 24 percent in 2015, rising by 3 percent per year to 84 percent in 2035. The CES obliges any nonexempt retail utility to hold clean energy credits equal to the required clean energy share multiplied by total retail electricity sales.

Generators designated as clean, and therefore qualified to receive clean energy credits for electricity production, are those that are renewable, natural gas, hydro, nuclear, or qualified waste-to-energy facilities that were placed in service after 1991. (This provision effectively excludes all existing nuclear and hydroelectric capacity from earning credits.) Coal units retrofitted with carbon capture and storage may also receive credits. To receive credits, a generator must have a carbon intensity of less than 0.82 metric tons of CO₂ per MWh. Credits may be banked for use in future years.

Retail utilities have the option of paying an alternative compliance payment (ACP) of \$0.03/kWh in 2015, rising by 5 percent per year in real dollars, in lieu of purchasing clean energy credits. Thus, the ACP imposes a ceiling on the price of credits.

Small utilities are exempt from compliance obligation, and the threshold defining small utilities is 2 million MWh of sales per year in 2015, falling by 100,000 MWh per year to 1 million MWh of sales per year in 2025 and beyond. Any electricity sales generated by a nuclear or hydro facility placed in service before 1992 (almost all of them) are also exempted from the standard, meaning they neither generate nor are required to hold credits.

Modeling Approach to Analysis of S. 2146

To gain insights into how the CES specified in S. 2146 would impact the U.S. electricity markets and associated emissions of CO₂, my colleagues at Resources for the Future and I used our electricity sector market model, known as Haiku. Outputs from the model include investment in new generating capacity, generation by fuel and technology, and CO₂ emissions and electricity prices by region of the country

as well as for the nation as a whole. In addition to analyzing the policy as specified, we also looked at the effects of different features of the policy, including the alternative compliance payment and the small utility exemption as well as other features.

Like all models, Haiku is an imperfect but useful tool for gaining insights into how policies like a CES affect the electricity sector. Specific model results will depend on particular assumptions about a variety of factors, including technology and fuel costs and the set of technologies included in the model.

The next several sections of this testimony discuss what we learned from this analysis about the likely effects of S. 2146 on greenhouse gas emissions and on electricity markets. Please note that all dollar amounts are expressed in real 2009 dollars.

CO₂ Emissions

The proposed CES legislation would reduce emissions of CO₂ from the electricity sector substantially. The CES would achieve 11.4 billion tons of cumulative CO₂ emissions reductions from electricity by 2035, or 21 percent of cumulative baseline emissions. In 2035 alone, the CES would achieve 1.1 billion tons of emissions reductions, or 41 percent of annual emissions in 2035 without the policy.

The United States has pledged, as part of the United Nations climate change conferences in Copenhagen and Cancun, to reduce economy-wide CO₂ emissions to 83 percent below 2005 levels by 2050. To be on a linear path to meet this goal, the United States would have to reduce total CO₂ emissions in 2035 by roughly 4.1 billion tons from 2005 levels, and the CES would contribute 27 percent of the United States' pledged CO₂ emissions reductions in 2035.

Electricity Generation by Technology and Fuel

The proposed CES legislation would bring about important changes in the composition of electricity supply that evolves over time. In the short run, by 2020, the CES will effect a swap of generation from coal to natural gas of almost 600 terawatt-hours TWh. By 2035, the policy will result in a substantial decline in coal-fired generation. The roughly 1,200 TWh decline in coal generation would be offset partially by about a 330 TWh reduction in consumption. Offsetting the remainder of the lost coal generation would be a variety of new generation sources. Large growth in natural gas generation (about 600 TWh) would be accompanied by more moderate growth in wind and nuclear generation (about 100 and 140 TWh, respectively). The mix of generation under the baseline and different specifications of the CES policy are displayed in Exhibit 1.*

National Average Retail Electricity Price

The CES in S. 2146 will have a moderate effect on average retail electricity prices during the first decade of the policy, followed by a period of substantial increases as the target and the alternative compliance payment levels both ramp up. Exhibit 2 shows national average retail electricity prices under the CES (red line) and the baseline (blue line) over time.

What explains the delayed price impact of the CES policy? Under a CES, retail electricity prices have two important components: the wholesale price of electric energy and the price of a CES credit, the latter of which is multiplied by the minimum clean energy share in each year. Because the CES leads to greater investment in clean technologies with low operating costs, such as wind or efficient natural gas, it will tend to increase the supply of electric energy and lead to lower wholesale energy prices, particularly in those regions with competitive wholesale electricity markets.

A CES policy also creates a new market for clean energy credits. The requirement for retail electricity suppliers to hold those credits in increasingly greater proportion over time as the clean energy standard rises means that the price of credits plays an increasingly bigger role in the determination of electricity prices over time. In the initial years of the program, the CES credit prices and credit requirements will be relatively low, with the small positive impacts on electricity prices typically offset by lower prices in wholesale energy markets. In cost-of-service regions, where prices are governed by average (or total) costs, the small short-run increase in prices resulting from credit requirements is offset by small reductions in costs resulting from a net export of credits to competitive regions. These countervailing effects of the CES yield approximately no short-run electricity price impacts for the nation as a whole. In the long run, the cost of the credit obligation increases as both the credit price and requirement rise, and it trumps all other factors affecting electricity

* Exhibits 1–4 have been retained in committee files.

prices. By 2035, the national average retail electricity price under the CES would exceed that in the absence of the policy by \$0.016/kWh (18 percent).

Regional Retail Electricity Prices

The lack of a noticeable initial effect of the CES policy on national average electricity prices masks important differences across regions of the country. Exhibit 3 shows the effects of the policy on retail electricity price by region in 2020. This map reveals that the regions of the country that rely most on coal-fired generation stand to experience small retail price increases, while the Northeast and Texas stand to pay substantially less for electricity with the CES than without it. Retail prices are also lower throughout much of the western part of the country in 2020 with the CES. By 2025, more regions experience price increases, as shown in Exhibit 4, but electricity prices are still lower with the policy than without it in the Northeast, the Northwest, and Texas.

After 2025 the policy tends to result in price increases in all regions, although the regions with a relatively clean mix of generators or a relatively high proportion of small utilities would experience a relatively small average retail price increase due to the CES, while regions that rely heavily on coal or that have very few small utilities would experience relatively larger retail price increases.

The Alternative Compliance Payment

The ACP provision of the bill is triggered in every year, which means that some portion of the retail utilities required to comply with the legislation will pay the ACP instead of purchasing clean energy credits and that in each year the clean energy credit price will equal the ACP. Expressed in 2009 dollars, the ACP starts out at \$0.026/kWh in 2015 and rises by 5 percent per year in real dollars to \$0.068/kWh in 2035. Without an ACP, the clean energy credit price would reach \$0.036/kWh in 2015 and \$0.092/kWh in 2035.

The ACP provision of the bill results in slightly lower costs to electricity consumers but it comes at a cost of reduced environmental efficacy. Without the ACP, electricity prices would be higher from 2025 on (as shown by comparing the red and purple lines in Exhibit 2), and would be roughly 4 percent higher in 2035. The binding ACP will prevent the fraction of power supplied by clean sources under the CES policy from reaching the minimum requirements specified in the bill. The elevated credit prices in a version of the CES without an ACP would engender more generation from clean sources and greater emissions reductions, amounting to an additional 12 percent of cumulative CO₂ emissions reductions by 2035 beyond those reductions projected under the CES policy specified in the bill.

The ACP provision also creates a pot of revenue, 75 percent of which is to be transferred back to the states for investment in energy efficiency initiatives. Over the 21-year period from 2015 through 2035, the CES policy in S. 2146 generates roughly \$9.5 billion dollars per year in annuitized ACP revenue. Adding 75 percent of this amount, or \$7.1 billion, to state energy efficiency budgets would represent a substantial increase to the \$8.5 billion (adjusted to 2009 dollars) that the Consortium for Energy Efficiency estimates was budgeted for expenditure on energy efficiency programs for both electricity and natural gas across the United States and Canada in 2011.

The Small Utility Exemption

Like the ACP, the small utility exemption provision of the bill also serves to dampen electricity price increases resulting from the CES. Without the exemption, the national average retail electricity price in 2035 would be 25 percent higher than baseline levels, compared to only 18 percent higher with the exemption in place. If both the ACP and the small utility exemption were struck from the policy, the national average retail electricity price would reach \$0.13/kWh by 2035, or 42 percent above baseline levels.

The benefits to consumers of a lower electricity price due to the small utility exemption accrue exclusively to the customers of the exempt utilities. Based on the 2009 distribution of utility sizes, we estimate the fraction of regional consumption that would be exempted under each level of the threshold and find that in 2015, roughly 17 percent of regional consumption is exempt from compliance. By 2025 and thereafter, the small utility exemption is projected to exempt roughly 12.5 percent of national electricity consumption from having to comply with the standard.

As a result of the small utility exemption, consumers served by the exempt utilities pay an average retail electricity price of only \$0.052/kWh in 2035 with the CES (assuming these utilities have the regional average mix of generating technologies), while the consumers of non-exempt utilities pay an average price of \$0.116/kWh. This average difference will be even greater when comparing prices across different regions. For example, customers of exempt utilities in the Northwest pay only

\$0.012/kWh in 2035, while consumers on Long Island, where no consumers are exempt, pay \$0.175/kWh. Eliminating the small utility exemption raises the average retail price at utilities that would have been exempted to \$0.109/kWh, while customers of non-exempt utilities pay the same average price of \$0.116/kWh. In other words, the small utility exemption allows consumers of 12.5 percent of total sales to enjoy an average retail electricity price reduction of \$0.057/kWh, while consumers of the remaining 87.5 percent see no benefit at all.

Removing the small utility exemption also has no effect on the mix of technologies and fuels used to produce electricity or on the CO₂ emissions reductions resulting from the policy. The reason removing the exemption has virtually no effect on the performance of the policy outside of the price impact on consumers of exempt utilities is because the ACP is binding and thus the price of clean energy credits is equal to the ACP. If there were no ACP, the small utility exemption would reduce the electricity consumption basis to which the CES is applied, which would in turn reduce the total amount of clean energy required by the policy, the credit price, and electricity prices for all consumers. However, with and without the small utility exemption, the ACP is binding, so clean energy generation is unchanged by removing the exemption. Instead, the main effect of the small utility exemption is to reduce the ACP revenues available to be disbursed to the states to fund end-use energy efficiency programs. Our results suggest that for a CES with no small utility exemption, the annuitized value of ACP revenue for each year between 2015 and 2035 increases by roughly \$10 billion per year to \$19.5 billion, 75 percent of which would be allocated to states for investment in energy efficiency under the provisions of the bill.

One potential unintended consequence of the small utility exemption is that by creating a substantial gap between retail prices for exempt and non-exempt utilities, the policy also creates an incentive for new small utilities to emerge. For example, groups of geographically proximate customers, such as small cities or towns, could decide to break away from their local utility and form their own small municipal utility to take advantage of the lower electricity prices.

The Existing Nuclear and Hydro Exclusion

The exclusion of generation from existing nuclear and hydroelectric capacity from compliance responsibility is another aspect of the bill with evident consequences for ratepayers. If certain nuclear or hydro facilities would reduce their production under the CES policy because they do not earn clean energy credits, excluding generation from those units from compliance obligation will reverse this effect, keeping that clean production online. Our modeling suggests that the CO₂ emissions consequences of the exclusion for existing nuclear and hydroelectric capacity are virtually zero because the 17 TWh of nuclear generation from existing facilities that would be lost without the exclusion are made up by additional generation at new nuclear facilities.

The implications of the existing nuclear and hydro exclusion for electricity consumers varies across regions depending on how electricity prices are set. In cost-of-service regulated regions of the country, the exclusion has virtually no effect on electricity prices. In regions where electricity is priced in competitive markets, the exclusion amounts to a wealth transfer from consumers to the owners of existing nuclear and hydroelectric generators. In some states, like New York, where some hydroelectric capacity is publicly owned, the ratepayers presumably will recapture part of the wealth transfer. In other cases, especially with respect to nuclear capacity, the transfer will remain with utility shareholders.

The CHAIRMAN. Thank you very much.
Ms. Greenwald, go ahead.

STATEMENT OF JUDI GREENWALD, VICE PRESIDENT FOR TECHNOLOGY AND INNOVATION, CENTER FOR CLIMATE AND ENERGY SOLUTIONS, ARLINGTON, VA

Ms. GREENWALD. Mr. Chairman, Senator Murkowski and members of the committee, thank you for the opportunity to testify. I'm Judi Greenwald, Vice President for Technology and Innovation at the Center for Climate and Energy Solutions.

C2ES is an independent, non-profit, non-partisan organization advancing practical and effective policies and actions to address our climate and energy challenges. Our work is informed by the 36

mostly Fortune 500 companies in our Business Environmental Leadership Council. The views I'm expressing are those of C2ES alone.

C2ES recently published 2 papers examining issues and options in designing a Clean Energy Standard. They ask that they be entered into the record.

The CHAIRMAN. We will include those. Thanks.

Ms. GREENWALD. Thanks.

A Clean Energy Standard is a market based approach that can achieve 3 objectives cost effectively.

Environmental and Public Health Protection.

The growth of new clean energy industries.

Diversification of electricity supply.

Thirty-one States and DC have adopted some form of Clean Energy Standards. These differ in a number of critical elements providing a wealth of State experience to draw from in designing a Federal program. State Clean Energy Standards accelerate the deployment of renewables with generally modest impacts on electricity rates.

They tend to favor the cheapest available renewable options. Although a number of States have driven innovation in less mature technologies. For example, by requiring that a certain fraction of the overall target be met using solar energy.

While most of the State standards focus on renewables, 4 States, Michigan, Ohio, Pennsylvania and West Virginia give credit to some non renewable generation as well. But they favor renewables compared to the other qualifying sources either by requiring that some portion of the clean energy targets be met with renewables or by giving renewables extra credit.

Senator Bingaman's bill embodies a number of innovative design features that reasonably balance the multiple objectives of a Clean Energy Standard.

These include a broad, all of the above definition of clean energy, maximizing flexibility and minimizing costs.

A target that starts off modestly but increases over time balancing effectiveness in cost and driving innovation.

Credits calculated based on carbon intensity appropriately rewarding environmental performance.

Some crediting for existing nuclear and hydro power balancing the goal of fairly sharing costs with the goal of recognizing clean energy investment.

Allowing utilities to pay an alternative compliance payment if clean energy credit prices get too high.

Advancing energy efficiency by providing credit for combined heat and power.

Using alternative compliance payments to fund State efficiency programs.

EIA's analysis indicates that the bill takes advantage of natural gas's near term price and availability while still driving innovation in much cleaner technologies. However, it's uncertain how each clean energy option will fare in the real world.

If policymakers want to ensure innovation in zero emitting technologies and avoid too much reliance on natural gas, they have a number of options.

They could exclude natural gas from the definition of clean energy.

They could draw from State experience and design the standard so that it favors or limits specific types of clean energy. I believe Senator Franken mentioned that option this morning.

Or they could put in place complimentary policies such as loan guarantees for nuclear power plants, tax credits for wind and solar power and subsidies for carbon capture and storage.

On the last point C2ES co-convened a coalition of industry, State, environmental and labor leaders. The National Enhanced Oil Recovery Initiative, neori.org, calling for a Federal tax credit for capturing and transporting CO₂ from industrial sources and power plants for use in enhanced oil recovery. This would expand domestic oil production and drive innovation in carbon capture and storage enabling coal to have a bigger role in a clean energy future.

EIA also projects that under the Bingaman proposal electricity prices would be largely unchanged until the mid 2020s giving people and companies both an incentive to increase their energy efficiency and potentially reduce their energy bills even as prices rise and ample time to do so.

The bill's alternative compliance payment would protect against unforeseen impacts.

Senator Bingaman, thank you for introducing this bill and beginning the public debate on this promising approach to protecting the environment, public health and diversifying energy supply. We look forward to working with you and your colleagues on the committee to analyze, refine and advance this proposal.

[The prepared statement of Ms. Greenwald follows:]

PREPARED STATEMENT OF JUDI GREENWALD, VICE PRESIDENT FOR TECHNOLOGY AND INNOVATION, CENTER FOR CLIMATE AND ENERGY SOLUTIONS, ARLINGTON, VA

Mr. Chairman, Senator Murkowski, and members of the Committee, thank you for the opportunity to testify on the Clean Energy Standard. My name is Judi Greenwald, and I am Vice President for Technology and Innovation at the Center for Climate and Energy Solutions (C2ES-formerly known as the Pew Center on Global Climate Change).

C2ES is an independent nonprofit, nonpartisan organization dedicated to advancing practical and effective policies and actions to address our global climate change and energy challenges. Our work is informed by our Business Environmental Leadership Council (BELC), a group of 36 major companies, most in the Fortune 500, that work with C2ES on climate change and energy risks, challenges, and solutions.

C2ES recently published two papers on the topic of this hearing, *Clean Energy Standards: State and Federal Policy Options and Implications* (jointly with the Regulatory Assistance Project),¹ and *An Illustrative Framework for a Clean Energy Standard for the Power Sector*.² I'd like to ask that they be entered into the record.

To summarize my testimony, C2ES applauds Senator Bingaman's leadership in introducing this bill. It begins the public debate on this promising approach to protecting the environment, diversifying energy supply, and promoting clean energy industries. C2ES believes that Senator Bingaman's proposal embodies a number of design features that are innovative and reasonably balance the multiple objectives of a Clean Energy Standard. In particular, we would highlight the following: a flexible, market-based approach including clean energy credit trading and banking; a target that starts off modestly but increases over time; a broad "all-of-the above" definition

¹Regulatory Assistance Project and Center for Climate and Energy Solutions, *Clean Energy Standards: State and Federal Policy Options and Implications* (2011), <http://www.c2es.org/docUploads/Clean-Energy-Standards-State-and-Federal-Policy-Options-and-Implications.pdf>.

²Center for Climate and Energy Solutions, *An Illustrative Framework for a Clean Energy Standard for the Power Sector*, (2011), <http://www.c2es.org/docUploads/CES-Framework.pdf>.

of clean energy; and a crediting system that rewards environmental performance based on carbon intensity.

My testimony will focus first on the general concept of a Clean Energy Standard, then on lessons from the state experience with such standards, and finally more specifically on Sen. Bingaman's proposed Clean Energy Standard Act of 2012.

Balancing our objectives with a Clean Energy Standard

I'd like to begin with a note on use of the word "clean." There is no commonly accepted definition of "clean" energy. Indeed, one person's definition of "clean" can differ dramatically from another's if their objectives for energy policy differ. Renewable energy, nuclear power, natural gas, coal with carbon capture and sequestration, energy efficiency, and emission offsets all have their advocates as falling under the definition of clean. Unless otherwise noted, in my testimony I will use the word "clean" to refer to these options generally and "conventional" to refer to all other forms of electricity generation.

Moving from conventional electricity generation to clean energy offers three types of possible benefit: the reduction of the environmental and public health damages associated with conventional electricity generation, the growth of new clean energy industries, and diversification of energy supply. A clean energy standard usually refers to a market-based approach that can achieve all of these objectives cost-effectively: it requires an increasing amount of clean electricity, but gives utilities the flexibility to comply by generating or buying clean power, or purchasing tradable clean energy "credits" (CECs), typically denominated in megawatt-hours.

One objective is the protection of public health and the environment. Electric power plants are the leading U.S. source of emissions of sulfur dioxide, mercury and many other metals, and acid gases.³ The electricity sector also ranks third among all U.S. sources of nitrogen oxide emissions and fourth in emissions of fine particulates.⁴ The vast majority of the emissions in this sector are associated with coal-fired power plants.⁵ Clean energy sources emit zero or very low levels of these pollutants.⁶

Today, the power sector is the source of about a third of U.S. greenhouse gas emissions.⁷ As we heard during the hearing the committee held on sea level rise a few weeks ago, recent findings in the peer-reviewed science provide only more cause for concern about the impacts of climate change. A properly designed clean energy standard would lead to the reduction of these emissions from power plants.

A second objective is to advance the position of the United States in the global competition to deliver the next generation of energy technologies. In a world hungry for energy services, we can be confident that modern energy technologies, especially those with a smaller environmental footprint than those we have today, will be a global growth area for decades to come. A recent report finds that global renewable energy finance and investment grew significantly in 2011 to \$263 billion, a 6.5 percent increase from the previous year. The renewable energy sector is emerging as one of the most dynamic and competitive in the world, witnessing 600 percent growth in finance and investments since 2004.⁸ A clean energy standard would spur technology and economic development in the United States, allowing the market to determine the winners among clean technologies.

A third objective is to ensure a diverse energy supply. Currently we obtain 42 percent of our electricity from coal, 25 percent from natural gas, 19 percent from nuclear, and 13 percent from renewables.⁹ Under business as usual, this energy mix is not expected to change significantly over the next two decades; while new builds are expected to be primarily natural gas, overall electric generation is growing fairly slowly.

³Joe Bryson, "Reducing Pollution from Power Plants" (presentation, National Association of State Utility Consumer Advocates Annual Meeting, Atlanta, GA, November 16, 2010).

⁴Ibid.

⁵Ibid.

⁶"Clean Energy: Non-Hydroelectric Renewable Energy," U.S. Environmental Protection Agency, last modified August 5, 2010, <http://www.epa.gov/cleanenergy/energy-and-you/affect/nonhydro.html>.

⁷"Energy in Brief: What are greenhouse gases and how much are emitted by the United States?," U.S. Energy Information Administration, last modified May 9, 2011, http://www.eia.gov/energy_in_brief/greenhouse_gas.cfm.

⁸The Pew Charitable Trusts, *Who's Winning the Clean Energy Race 2011 Edition* (Washington, DC: The Pew Charitable Trusts, 2012), http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/FINAL_forweb_WhoIsWinningTheCleanEnergyRace-REPORT-2012.pdf.

⁹"Total Energy Data: Table 7.2a Electricity Net Generation 2011," U.S. Energy Information Administration, April 2012, http://www.eia.gov/totalenergy/data/monthly/pdf/sec7_5.pdf

In many respects, a properly designed clean energy standard would advance all three objectives. There are a few aspects in the design of a clean energy standard, however, that require one to choose between the objectives, or at least to strike a balance between them. Design choices may be evaluated in light of additional criteria, including:

- Effectiveness—what is the magnitude of the policy’s desired impacts?
- Affordability—does the policy balance the benefits associated with increased clean power generation against the cost impacts of the policy?
- Cost-effectiveness—how efficiently does the policy achieve its intended aims?
- Fairness—does the policy unfairly burden particular groups or regions or lead to any undue burdens or unearned windfalls for particular utilities, power generators, or customers?
- Innovation—does the policy drive innovation in the lowest-emitting and/or least mature technologies with the greatest potential long-term benefits?

I’ll elaborate on a few examples of how design choices can involve tradeoffs and affect costs.

Targets, coverage, and alternative compliance payments—More ambitious clean energy targets will achieve greater benefits and drive greater innovation in the lowest-emitting technologies, but at higher cost. Broader inclusion of electric utility companies will increase the effectiveness of the standard and more broadly share the costs, but could impose greater administrative burdens. Allowing utilities to pay an alternative compliance payment if clean energy credit prices get too high limits the rate impacts but can also reduce the effectiveness of the targets.

Definition of clean energy—In general, a broader definition of clean energy will lower the cost because it allows greater scope for identifying the least expensive solutions. It also makes the standard more equitable across regions, because different regions have different natural endowments of different types of clean energy. Supply diversity is also a hedge against price volatility. However, because different types of clean energy have different characteristics, policy-makers might not be neutral with respect to the role each type plays. There are many possible compromises on this issue, depending on the attribute of concern.

As an illustration, natural gas is lower-emitting than coal but higher-emitting than nuclear or renewables. A compromise is to award natural gas partial credit. In addition, advances in shale gas production have increased the availability of inexpensive natural gas. Thus, providing credit for natural gas reduces the cost of achieving the CES target. However, since natural gas is already the dominant choice for new power plant builds, there is a risk that the power sector will become too reliant on natural gas, crowding out other options.

Inherently, a clean energy standard will favor the lowest-cost clean energy source. But policy-makers may want to drive innovation and cost reduction in less mature, advanced clean energy technologies. A compromise might be to place a limit on how many credits can be distributed to the lowest-cost clean energy source. Another option is to provide additional favorable treatment to the lowest-emitting or least mature technologies (e.g., by granting certain subcategories of technologies additional credits, or guaranteeing them a role by establishing “tiers” with separate targets). Finally, policy-makers can design the CES to be technology-neutral, and rely on complementary policies (such as loan guarantees or other financial assistance for nuclear power plants, subsidies for carbon capture and storage, and tax credits for wind and solar power) to drive innovation in less mature and lower-emitting technologies.

The role of energy efficiency—Energy efficiency is cleaner than any of the energy supply options. Providing credit for energy efficiency can lower cost, but increase the complexity of the standard and potentially diminish its effectiveness. Measuring electricity savings from energy efficiency is more challenging than measuring generation from qualified clean energy sources, and it is especially difficult to distinguish energy savings driven by the standard from business as usual.

Crediting existing clean generation—On the one hand, it is fair to reward early clean energy investment. On the other hand, such crediting could result in windfall profits and reduce new clean energy production.

State experience with renewable and alternative energy standards

We have substantial experience with renewable and alternative energy standards at the state level. At this point, 31 states and the District of Columbia have adopted some form of mandatory electricity portfolio standards through legislation, regulation, or public utility commission order. Another eight states have adopted non-man-

datory renewable portfolio goals.¹⁰ These policies differ in a number of the design elements described above.¹¹ Thus we have a wealth of state experience to draw from in designing a federal program. In addition, 22 states have established mandatory long-term electricity savings targets through an Energy Efficiency Resource Standard (EERS), with five other states having a non-mandatory electricity savings goal.¹² In some of these cases, the state electricity portfolio standard is combined with or linked to the EERS policy.

Perhaps the most important lesson to be learned from state portfolio standards is that they succeed in accelerating the deployment of renewable resources.¹³ Ninety percent of the nonhydro renewable capacity added in the United States between 2004 and 2010 was built in states with a mandatory renewable portfolio standard.¹⁴ Another clear (and expected) lesson is that state portfolio standards tend to result in the deployment of the cheapest available renewable energy options. In most states, this means utility-scale wind power projects.¹⁵ State portfolio standards are given a good deal of credit for establishing a viable wind turbine supply chain in the United States, along with training and credential programs and some domestic manufacturing facilities.¹⁶ A number of states have driven some innovation in less mature technologies, for example by establishing “carve-outs” requiring that a certain fraction of the requirement be met using solar energy.

A third key lesson is that the impact of portfolio standards on electricity rates has been generally modest, though it is difficult to isolate this impact from other factors that influence prices.¹⁷ Of 14 states where compliance cost data are available, Arizona had the highest impact in 2010 of nearly 4 percent.¹⁸ No other of these states saw a rate impact above 2 percent.¹⁹ As a typical example, the Maine Public Utilities Commission estimates a 0.6 percent increase in rates in 2010 caused by its portfolio standard of 40 percent renewable energy by 2017, and expects a 1.9 percent increase by 2017.²⁰ Due to the price stability of long-term renewable energy contracts, the portfolio standard may even help reduce rates in some states.²¹

While most of the state portfolio standards focus on energy sources that are renewable, nonrenewable electric generation technologies are given credit in the programs of four states—Michigan, Ohio, Pennsylvania and West Virginia. Natural gas, coal with carbon capture and storage (CCS), coal gasification and liquefaction, coal bed methane, nuclear power, industrial combined heat and power, and greenhouse gas offset projects are given credit under one or more of these programs, in addition, of course, to the traditional renewable energy sources. All of these states have taken an approach that favors renewable sources compared to the other qualifying sources, either by establishing “tiers” that define some fraction of the clean energy targets that must be achieved by renewable sources, or by giving renewable sources extra credits.

¹⁰“Renewable & Alternative Energy Portfolio Standards,” Center for Climate and Energy Solutions, last modified January 20, 2012, http://www.c2es.org/what_s_being_done_in_the_states/rps.cfm.

¹¹Ryan Wisner and Galen Barbose, “The State of the States: Updated on the Implementation of U.S. Renewable Portfolio Standards,” (presentation, 2011 National Summit on RPS, Washington, DC, October 26, 2011) <http://www.cleanenergystates.org/assets/Uploads/2011-RPS-Summit-Combined-Presentations-File.pdf>.

¹²“Energy Efficiency Resource Standard,” Database of State Incentives for Renewables & Efficiency, <http://www.dsireusa.org/>.

¹³Ryan Wisner and Galen Barbose, “The State of the States: Updated on the Implementation of U.S. Renewable Portfolio Standards,” (presentation, 2011 National Summit on RPS, Washington, DC, October 26, 2011), <http://www.cleanenergystates.org/assets/Uploads/2011-RPS-Summit-Combined-Presentations-File.pdf>.

¹⁴Regulatory Assistance Project and Center for Climate and Energy Solutions, Clean Energy Standards: State and Federal Policy Options and Implications (2011), <http://www.c2es.org/docUploads/Clean-Energy-Standards-State-and-Federal-Policy-Options-and-Implications.pdf>.

¹⁵Chen et al., Weighing the Costs and Benefits of State Renewables Portfolio Standards: A Comparative Analysis of State-Level Policy Impact Projections (Berkeley, CA: Lawrence Berkeley National Laboratory, 2007), <http://eetd.lbl.gov/ea/EMP/reports/61580.pdf>.

¹⁶Ibid.

¹⁷Ibid.

¹⁸Ryan Wisner and Galen Barbose, “The State of the States: Updated on the Implementation of U.S. Renewable Portfolio Standards,” (presentation, 2011 National Summit on RPS, Washington, DC, October 26, 2011), <http://www.cleanenergystates.org/assets/Uploads/2011-RPS-Summit-Combined-Presentations-File.pdf>.

¹⁹Ibid.

²⁰London Economics International LLC for the Maine Public Utilities Commission, MPUC RPS Report 2011-Review of RPS Requirements and Compliance in Maine (Boston, MA: London Economics International LLC, 2012), <http://www.maine.gov/tools/whatsnew/attach.php?id=349454&an=1>.

²¹Ibid.

The proposed Clean Energy Standard Act of 2012

Let us now turn to Sen. Bingaman's bill, the Clean Energy Standard Act of 2012. The bill would, beginning in 2015, require covered electric utilities to supply an increasing share of their electricity sales from qualifying clean energy sources. Utilities could comply by building their own clean power plants, buying clean power from others, or buying tradable clean energy credits.

Senator Bingaman's CES proposal embodies a number of design features, including the following, that are innovative and reasonably balance the multiple objectives I described earlier:

- A target that starts off modestly but increases over time, balancing effectiveness and cost, and driving innovation;
- A broad, "all-of-the above" definition of clean energy, maximizing flexibility and minimizing cost;
- Appropriately rewarding environmental performance by calculating credits based on carbon intensity;
- Providing some credit for existing nuclear and hydropower, balancing the goal of fairly sharing costs with the goal of recognizing clean energy investment;
- Allowing banking of clean energy credits, affording additional compliance flexibility;
- Allowing utilities to pay an alternative compliance payment if clean energy credit prices get too high, but escalating the payment over time; and
- Advancing energy efficiency by providing credit for combined heat and power, and using alternate compliance payments to fund state efficiency programs.

At Sen. Bingaman's request the Energy Information Administration has analyzed the implications of the bill using the National Energy Modeling System. As with all economic modeling, we should look at the EIA's work for insights, rather than for hard and fast predictions about the future. In that spirit, we offer the following additional observations about the bill.

The Act and natural gas

Pertaining to the balancing of natural gas against the other clean energy technologies, the EIA projects that under the proposed standard, in 2035, natural gas will be 31 percent, nuclear power will be 30 percent, and renewables will be 20 percent of the total generation mix.²² According to EIA's scenario, the bill drives the largest increase in natural gas use in the early years, but as the standard becomes more ambitious, we see an increase in lower-emitting technologies. In 2020, natural gas-fired generation under the proposed standard is 13 percent higher than in the reference scenario; by 2035 it is 8 percent higher.²³ Thus the bill takes advantage of natural gas's near-term price and availability while still driving innovation in much cleaner technologies. Additionally, the investment in a range of low emitting technologies in response to the CES provides supply diversity, and a hedge against potential volatility in the price of natural gas.

Moreover, the EIA projects only a modest natural gas price increase, as increased consumption from the electric power sector leads to prices around 10 percent higher than the reference case from 2015–2018. Then, the price converges to reference case levels over the following five years.²⁴ Given the very low projected price of natural gas, in absolute terms, this is actually a small increase. This is good news, considering the current investments being made by manufacturers on the basis of projected low natural gas prices.

The Act and very low-emitting technologies

This modestly increased role for gas, however, depends on a significant increase in one or more very low-emitting technologies. EIA projects especially large growth in nuclear power that may or may not come to pass. EIA also projects some increase in biomass, wind and solar power, but no increase in coal (or gas) with carbon capture and storage. In EIA's analysis of a case in which new nuclear plant builds were constrained, and other assumptions were held constant, natural gas played a more significant role, and this uniformly raised the projected price of natural gas. One could still project a more modest role for natural gas with less growth in nuclear power but with more optimistic assumptions for renewables and/or carbon capture and storage.

²² "Analysis of the Clean Energy Standard Act of 2012: Scenario Case Data," U.S. Energy Information Administration, last accessed May 11, 2012, <http://www.eia.gov/analysis/requests/bces12/>.

²³ *Ibid.*

²⁴ *Ibid.*

If policy-makers are interested in ensuring innovation in zero-emitting technologies, policy options are available, as discussed earlier. In any event, C2ES would strongly recommend making a Clean Energy Standard just one component of a comprehensive strategy to advance the very low-emitting technologies - nuclear power, renewable energy, and carbon capture and storage—a strategy that includes support for R&D, as well as subsidies to allow power companies and others to deploy the technologies.

Nuclear power plants face a number of major hurdles. One hurdle that policy-makers could address is obtaining financing, for example by continuing and potentially expanding the current loan guarantee program and/or providing other forms of financial assistance to a few “first mover” next-generation nuclear plants. This could demonstrate to potential investors that these plants can indeed be built with lower cost and improved safety features, setting the stage for second, third, and nth movers to obtain private financing. This would increase the likelihood of nuclear power playing a significant role in achieving a clean energy standard.

For wind and solar power, EIA projects increases that are significant but not nearly as large as for nuclear power, relative to the reference case. Also, EIA assumes that the production tax credit (PTC) for wind expires in 2012, and the investment tax credit (ITC) for solar expires in 2016. Extending the PTC and ITC could incentivize additional solar and wind investment beyond what would be built solely to comply with the CES.

EIA projects that additional coal (or gas) with CCS will not be deployed under this bill because it is not cost-competitive with other clean energy options. It is technically feasible today to build a commercial-scale CCS operation, which several power companies are doing.²⁵ However, CCS is very expensive due to its current stage of development,²⁶ and planned projects are limited primarily because of uncertainty with respect to the regulation of CO₂ emissions. Coal—and natural gas-fired generation will likely be significant sources of electricity in the United States, and indeed in most of world’s major economies, for decades to come. Thus, ultimately, in order to deeply reduce U.S. and global GHG emissions, we need CCS.²⁷

One approach for advancing CCS would involve utilizing the CO₂ as a resource, rather than treating it as a waste product. C2ES is a co-convenor of a coalition of industry, state, environmental and labor leaders, known as the National Enhanced Oil Recovery Initiative (www.neori.org), which has called for a federal tax credit for capturing and transporting CO₂ from industrial sources and power plants for use in enhanced oil recovery.²⁸ In addition to driving a lot of domestic oil production, a benefit of such a program would be to generate an additional revenue stream to cover the cost of CCS. We would expect that as CCS costs come down, it would enable coal to have a bigger role.²⁹

Other Impacts of the Act

EIA projects that under the CES, electricity prices would not experience a significant impact until the mid 2020s. The projected average end-use electricity price under Senator Bingaman’s bill exceeds the Reference case by only 1.5 percent in 2023, but that grows to more than 18 percent by 2035. There would be almost no impact for the first ten years, with a gradual increase over the next dozen years, giving people and companies both an incentive to increase their energy efficiency (and potentially reduce their energy bills even as prices increase) and ample time to do so.

Also, total combined heat and power (CHP) generation would benefit from the policy provision that allows qualified CHP generators to earn and sell clean energy credits. According to the EIA, CHP generation fired by natural gas under the bill

²⁵“Projects,” Global CCS Institute, last accessed May 10, 2012, <http://www.globalccsinstitute.com/projects/browse>.

²⁶“Levelized Cost of New Generation Resources in the Annual Energy Outlook 2011,” U.S. Energy Information Administration, last accessed May 11, 2012, http://www.eia.gov/forecasts/archives/aeo11/electricity_generation.cfm#1.

²⁷Naomi Pena and Edward S. Rubin, *A Trust Fund Approach to Accelerating Deployment of CCS: Options and Considerations*, (Center for Climate and Energy Solutions, 2008), <http://www.c2es.org/docUploads/Trust-Fund-FINAL.pdf>.

²⁸National Enhanced Oil Recovery Initiative, *Carbon Dioxide Enhanced Oil Recovery: A Critical Domestic Energy, Economic, and Environmental Opportunity* (Washington, DC: 2012), http://www.neori.org/NEORI_Report.pdf.

²⁹National Energy Technology Lab, *Carbon Dioxide Enhanced Oil Recovery* (U.S. Department of Energy, 2010), http://www.netl.doe.gov/technologies/oil-gas/publications/EP/small_CO2_eor_primer.pdf.

exceeds the Reference case by 8 percent in 2025 and by 21 percent in 2035. CHP saves energy and promotes industrial competitiveness.³⁰

Conclusion

Senator Bingaman, thank you for introducing this bill and beginning the public debate on this promising approach to protecting the environment, diversifying energy supply, and promoting clean energy industries. C2ES is grateful for your leadership, and we look forward to working with you and your colleagues on the Committee to analyze, refine and advance this proposal.

The CHAIRMAN. Thank you very much.

Mr. O'Mara.

STATEMENT OF COLLIN O'MARA, SECRETARY, DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL, DOVER, DE

Mr. O'MARA. Chairman Bingaman, Ranking Member Murkowski, members of the committee, thank you for having us today. On behalf of the Governor of the great State of Delaware, Jack Markell, we appreciate the opportunity.

My name is Collin O'Mara and I serve as the Secretary of Energy and Environment. For the past 3 years we've been working hard to modernize Delaware's entire energy fleet in an effort to improve reliability, reduce and stabilize costs, spur local job creation, improve air quality, reduce greenhouse gas emissions and obviously improve public health. To achieve these outcomes we've worked on a lot of different fronts many of which are contained within this bill.

We've worked to in spur additional local generation from natural gas, from combined cycle, co-gen and combined heat and power to transform our largest coal unit into one of the Nation's cleanest, 2 fuel switch or phaseout, legacy units, to invest in energy efficiency and demand response, to support transmission and distribution upgrades and to deploy clean, renewable energy.

All these things together are resulting in significant private investment and new local jobs in manufacturing, construction and facility operations. Since 2009 Delaware has benefited from more than \$2 billion of investment in energy facility modernization and thousands of jobs being created in energy related industries. Delaware companies like NRG, Calpine, PBF, DuPont, Perdue, Mountaire, Ervaz Steel and Croda have all made significant upgrades to their energy facilities.

At the same time we're experiencing declining energy bills and dramatic reductions of both carbon emissions and traditional pollutants. It's the equivalent of taking nearly half a million cars off the road. So, if you've ever been stuck in Delaware and see a lot of cars that will get you through 95 a little quicker.

We believe that Delaware's experience demonstrates that the conversion to a cleaner energy system, as proposed through Senator Bingaman's 2146, is not only technically feasible, but it also advances numerous polar policy goals ranging from enhancing American competitiveness and supporting job creation to improving air quality and public health. The predictability alone created by a national and technology agnostic Clean Energy Standard will

³⁰"Cogeneration / Combined Heat and Power (CHP)," Center for Climate and Energy Solutions, last modified March 2011, <http://www.c2es.org/technology/factsheet/CogenerationCHP>.

drive private investment in innovation, manufacturing facilities and deployment of scales of a range of clean technologies.

Based upon our experience in Delaware we offer 3 recommendations to strengthen the proposed legislation.

The first one is to please ensure complementarity with the State standards. 40 States have either a renewable portfolio standard or a goal or an energy efficiency resource standard. In Delaware we've seen our energy standards drive manufacturing and construction and construction jobs.

Recently with the help of Senator Carper and Senator Coons, Governor Markell was able to announce the decision of Bloom Energy, an innovative fuel cell company. That they were going to locate their manufacturing plant in Delaware on the site of a former Chrysler facility. They're going to be creating about 1,000 jobs manufacturing this technology of the future.

We've also seen significant private investment in energy efficiency, solar, geothermal and hopefully 1 day, offshore wind, as that becomes more financeable.

We greatly appreciate Section L in the legislation and recommend its inclusion to preclude any kind of State exemption or State pre-emption. To the point of Senator Wyden, we do believe that the suggestion of providing some kind of authority for the Secretary of Energy in Section L, Subsection 2, to establish some form of alternative compliance pathway through which States that have these policies in place can demonstrate that they meet or exceed CES requirements and be exempted or get a waiver for having already achieved the outcome intended by the legislation.

No. 2 is the importance of energy efficiency. There's been a lot of debate today about cost. This committee has championed in the importance of advancing energy efficiency including the strong bipartisan passage of the Shaheen-Portman S. 1000 last year.

Investments in energy efficiency and other electricity demand reducing technologies including geothermal, solar thermal, district heating, co-gen, CHP and more have significant potential to reduce emissions in the most cost effective manner. Energy efficiency is our Nation's greatest energy supply resource. It represents the greatest opportunity we have to reduce energy costs for everyone and reduce emissions at the same time. It will spur investments in every single State in the Union.

For these reasons, as Senator Shaheen mentioned just a few minutes ago, we encourage the inclusion in the CES of energy efficiency from the onset. This will ensure that CES actually reduces overall energy costs even well below the EIA reference case that we discussed in the last panel.

To accomplish this we believe that we recommend that the Secretary of Energy be directed to establish a national evaluation measurement and verification standard. Many States have good models that could be built upon. This standard would then define how energy efficiency investments would count toward the CES requirements. Once completed would allow these technologies to be eligible under the CES. We believe that it's critical to do this from the beginning because it is the best way to reduce energy prices across the entire country.

In addition we support the language in Section J which directs the alternative compliance payments to be provided to the States many of which have a very strong track records and years of experience implementing energy efficiency programs.

Delaware, for example, has worked with many different utilities and many different companies to support a wide range of efficiency programs to help local governments, homeowners, businesses, heavy industry, agriculture and low income families. We believe these successes can be replicated across the country.

My third point is that on the evaluation of emissions. The CES does present an incredible opportunity to have a technology agnostic approach to have all technologies compete fairly in the marketplace in a manner that actually aligns environmental incentives and economic interests in the same way. To ensure that the projected overall emission reductions are actually achieved we do suggest that the Secretary of Energy is directed in Section G of the legislation to incorporate life cycle emissions into the carbon intensity calculations, at least going forward to make sure that we're actually reducing overall aggregate emissions to the best of our ability.

In summary, we commend the leadership of the entire committee. Senator Bingaman in particular, for his years of leadership on this issue and the co-sponsors for introducing this legislation which we believe carefully balances the goal of expanding the generation of a clean, domestic energy in a way that meets our long term and economic goals.

I'm very grateful again for the opportunity to represent Delaware today and look forward to your questions. So, thank you.

[The prepared statement of Mr. O'Mara follows:]

PREPARED STATEMENT OF COLLIN O'MARA, SECRETARY, DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL, DOVER, DE

Chairman Bingaman, Ranking Member Murkowski, and members of the Committee, on behalf of Delaware Governor Jack Markell, thank you for the opportunity to testify today.

For the past three years, we have been working to modernize Delaware's electric power generation fleet in an effort to improve reliability, reduce and stabilize both short-term and long-term energy costs, spur local job creation, improve air quality, reduce greenhouse gas emissions, and improve public health. To achieve these outcomes, we have worked on several initiatives: to spur additional local generation from natural gas combined-cycle, co-generation, and combined heat and power units¹; to transform our largest coal plant into one of the nation's cleanest; to fuel switch or phase-out legacy units; to invest in energy efficiency and demand response; to support transmission and distribution upgrades; and to deploy clean renewable sources of energy (solar, fuel cells, geothermal, and eventually offshore wind when financeable/cost-effective)².

This strategy is resulting in significant private investment and new local jobs in manufacturing, construction, and facility operations. Since 2009, Delaware has enjoyed more than \$2 billion of private investment in energy facility modernization and thousands of jobs created in energy-related industries. Delaware companies, in-

¹Delaware is working to take advantage of low priced natural gas for in-state generation and also are working with our neighboring states to ensure that additional natural gas from hydraulic fracturing is extracted safely to ensure that current and future generations can benefit from this cleaner source of domestic energy.

²Delaware currently has 1,171 solar photovoltaic systems in operation comprising 28 megawatts of installed capacity. The State Green Energy Program also has enabled the installation of 77 solar thermal water heaters (capacity: 4,712 square feet) and 1,011 geothermal heat pumps (capacity: 5,232.5 tons). Also, Bloom Energy is in the process of installing 30 MW of fuel cell capacity in Delaware.

cluding NRG, Calpine, PBF, DuPont, Perdue, Mountaire, Evraz Steel, and Croda, have all made significant upgrades to their energy facilities. Most of these projects have been true public-private partnerships with state providing assistance either with the financing or expedited permitting to ensure completion. At the same time, we are experiencing declining energy bills and dramatic reductions in carbon emissions and traditional pollutants from our power generation sector³. These ongoing efforts have reduced air pollution by the equivalent of taking almost half a million cars off the road.

We believe that Delaware's experience is a success, but not unique. It demonstrates that the conversion to a cleaner energy system, as proposed through S. 2146, is not only technically feasible, but also advances numerous policy goals, ranging from enhancing American competitiveness and supporting job creation to improving air quality. A national Clean Energy Standard (CES) provides predictability for consumers and manufacturers alike and encourages private investment in innovation, manufacturing facilities, and deployment at scale—all of which ultimately drive down consumer costs, support job creation, and improve environmental outcomes.

Based upon our experience, here are a few recommendations which could strengthen the proposed legislation:

1. **Complementarity with State Standards**—Forty states, including Delaware, have adopted some form of a Renewable Portfolio Standard/Goal and/or an Energy Efficiency Resource Standard.⁴ In Delaware, we have seen our energy standard drive manufacturing and construction jobs. Recently, with the help of Senators Carper and Coons, Governor Markell announced the decision of Bloom Energy to manufacture their next generation solid oxide fuel cell in Delaware, creating nearly 1000 jobs on the site of a former Chrysler auto plant which is being transformed into the University of Delaware's Science Technology and Advanced Research (STAR) Park. DuPont is building its North American Photovoltaic Research Center in Delaware and local solar manufacturers, including Motech Americas (photovoltaic) and SolarDock (racking), just received record orders for their products. Hundreds of construction jobs have been supported by the deployment of more than 28 megawatts of solar photovoltaic, more than 5200 tons of geothermal heat pumps, and 30 megawatts of fuel cells.

On behalf of the states with existing standards, we appreciate Section (1) and recommend its continued inclusion to avoid any form of state preemption. In addition, we suggest providing authority for the Secretary of Energy in Section (1) subsection (2) to establish an alternative compliance pathway through which states can demonstrate that their policies meet or exceed emission reductions required under the national standard to avoid creation of multiple regulatory regimes.

2. **Importance of Energy Efficiency**—This Committee has clearly understood the importance of advancing innovative, non-generation energy opportunities, among them recognizing the power of energy efficiency. This is embodied in the strong, bipartisan passage of the Shaheen/Portman bill (S. 1000) last year. While challenging to integrate into an energy standard primarily established for power generation, investments in technologies that reduce or displace energy consumption, including energy efficiency, geothermal, solar thermal, district heating, and more, have significant potential to reduce emissions in a cost-effective manner.

In particular, energy efficiency is our nation's greatest energy supply resource and represents the greatest potential to reduce energy costs compared to any other supply alternative.⁵ Allowing energy efficiency technologies into the CES from the beginning will ensure that the standard reduces overall implementation costs, even below the status quo reference

³However, Delaware receives more than 90% of its air pollution from upwind sources, and thus our ability to ensure clean air depends on similar actions by upwind states.

⁴Delaware's Renewable Portfolio Standard is 25% by 2025 and the state's Energy Efficiency Resource Standard is 15% by 2015. Thirty-one states have Renewable Portfolio Standard or Alternative Energy and Renewable Portfolio Standard policies: AZ, CA, CO, CT, DE, HI, IL, IA, KS, MA, ME, MD, MI, MN, MS, MO, NV, NH, NJ, NM, NY, NC, OH, OR, PA, RI, TX, VT, WA, WI, WV, as do DC and PR. Eight additional states have renewable portfolio goals: AK, FL, IN, OK, ND, SD, UT, VA. Twenty-six states have Energy Efficiency, Resource Standard policies currently in place: AZ, AK, CA, CO, DE, HI, IL, IN, IA, MA, ME, MD, MI, MN, NC, NM, NV, NY, OH, OR, PA, RI, TX, VT, WA, WI (www.c2es.org; www.aceee.org).

⁵ACEEE has estimated that 16–30% of all energy consumption could be reduced through cost-effective efficiency measures by 2035. Cost-effective energy efficiency means that by definition these activities would reduce energy costs from the reference case and thus would significantly reduce the price impact of the CES.

case projected by the Energy Information Administration (EIA).⁶ Significant efficiency opportunities exist in every state that are achievable and easy to implement in the near-term and several states have repeatedly demonstrated the numerous benefits of energy efficiency investments, including local job creation, increased disposable income to support local economies, healthier buildings, and more productive employees.

While Section (n) recognizes the importance of energy efficiency and other electricity demand reducing technologies, we encourage the inclusion of these technologies in the initial standard, possibly in a manner similar to the treatment of heat from a CHP unit, rather than waiting for a report from the Secretary of Energy. Specifically, we suggest that S. 2146 include these technologies as eligible resources and direct the Secretary of Energy to establish a national Evaluation, Measurement, and Verification (EM&V) standard, which would define how efficiency investments would be counted towards the CES requirements.⁷

Alternatively, Section (n) could give the Secretary of Energy the ability to incorporate the findings of the required report directly into the standard, rather than as recommendations, if they are demonstrated to reduce compliance costs. Ideally, the report would be required much earlier than the currently drafted three year timeframe, which would have the unfortunate and unintended consequence of unnecessarily delaying cost-savings and creation of local jobs for multiple years.

Either approach would drive additional near-term investment, significantly reduce compliance costs (below the EIA reference case), spur greater job creation,⁸ and unleash opportunities to reduce emissions well-below the projected 40 percent reduction by 2035 at the lowest possible cost.⁹

In addition, we support the language in Section (j), which directs that alternative compliance payments be provided to the states, many of which have a strong track record of implementing energy efficiency programs. Delaware, for example, has worked with the Delaware Sustainable Energy Utility and local electric and gas utilities, including the Delaware Electric Cooperative, Delmarva Power and Light, the Delaware Municipal Electric Corporation, and Chesapeake Utilities, to support a wide range of efficiency programs to help local governments, homeowners, businesses, heavy industry, agriculture, and low-income families.¹⁰

3. Evaluation of emissions—The proposed CES presents an opportunity to have all technologies compete fairly and in a manner that aligns economic and environmental interests. However, to ensure that the anticipated reduction in aggregate greenhouse gas emissions are realized, we suggest directing the Secretary of Energy in Section (g) to incorporate lifecycle emissions into the carbon-intensity calculation to allow apples-to-apples comparisons among technologies and to ensure that projected overall emission reductions are achieved.¹¹

In summary, we commend the leadership of Senator Bingaman and other cosponsors for having the foresight to introduce this legislation. We believe that S. 2146 carefully balances the goal of expanding the generation of a diversity of domestically available clean energy sources in a way that meets our long-term economic goals and reduces greenhouse gas emissions and other pollutants. We believe that legislation of this nature can and should be implemented on a federal level, which would provide multiple benefits nationwide and support clean energy initiatives already underway in more than half of the states.

Again, thank you for the opportunity to testify before you today on this important legislation. I look forward to answering any questions.

⁶Delaware, like several other states, is working to determine the best way to integrate established, but separate, RPS and EERS statutes—a challenge which an integrated CES could avoid from the onset.

⁷The states would be required to implement EM&V standards established by the Secretary of Energy.

⁸Numerous studies, including recent analysis by ACEEE, have shown that 17–20 jobs are created for every \$1 million invested in energy efficiency compared to less than 10 jobs for traditional energy generation projects.

⁹If the concern exists that the allowance of energy efficiency could crowd out other technologies, possible remedies include increasing annual CES requirements, including energy displaced by energy efficiency in a utilities' total sales calculation, or allowing unlimited energy efficiency to be credited only during a defined period of time.

¹⁰Delaware participates in the Regional Greenhouse Gas Initiative and uses the proceeds for efficiency programs.

¹¹While a full lifecycle analysis is preferable, the carbon intensity calculation should be calculated from the gross emissions necessary for generating electricity, rather than the net emissions after deducting any electricity consumed for plant operations.

The CHAIRMAN. Thank you very much.
Mr. Gibson.

**STATEMENT OF THOMAS J. GIBSON, PRESIDENT AND CEO,
AMERICAN IRON AND STEEL INSTITUTE**

Mr. GIBSON. Chairman Bingaman, Ranking Member Murkowski, members of the committee, thank you for the invitation to appear today. I am Tom Gibson, President and CEO of the American Iron and Steel Institute. AISI is comprised of 25 member companies producing 3-quarters of U.S. and North American steel.

AISI is concerned about electricity costs and reliability issues that may result from additional regulation of the electricity sector. The simple fact is that compliance costs will ultimately be passed on to us, the consumers. Excuse me.

Like the rest of our economy, the steel industry is recovering from the depths of the recession but it's far from fully recovered. There are positive signs that the economy continues on a slow, but steady recovery although subject to volatility, particularly related to the downturn in Europe and the slowdown of the Chinese economy. Our latest 2012 estimate is for domestic steel shipments of 97 million tons which would be an increase of roughly 5 percent over 2011.

But this amount only matches our shipments in 1995. Only represents 90 percent of our 5 year pre-recession average. The production of steel is inherently energy intensive and the industry consumes substantial amounts of electricity, natural gas, coal and coke.

In 2010, the steel industry consumed 45 billion kilowatt hours of electricity. Overall, energy is typically 20 percent or more of the cost of making steel. So reducing energy use is critical to profitability. It's critical to competitiveness and it's a core value for our members.

The United States industry has effectively set the bar for steel energy efficiency worldwide reducing its energy intensity by 27 percent since 1990 or reducing its greenhouse gas emissions by 33 percent over the same period. DOE data confirms that our steel industry has the lowest energy intensity and second lowest CO₂ emissions intensity of any major steel producing country. The U.S. is winning the race for clean steel.

The EIA analysis of S. 2146 highlights our key concerns that a CES will raise the price of electricity to customers and to large industrial facilities in particular. EIA projects that by 2035 national electricity prices will be 18 percent higher than the reference case. But for industrial consumers the report concludes electricity will cost 25 percent more.

The economic impact will be exacerbated for the steel industry due to the so called regional differences in the fuel mix and the cost to switch to other fuels. A national CES will have a disproportionate impact on coal fired utilities. There's a high correlation between the service areas of those utilities and the location of steel and iron production facilities such as the 2 States that lead the Nation in steel production, Indiana and Ohio.

The domestic steel industry is subject to substantial international competition. In particular this competition comes from Na-

tions such as China where the industry is largely State owned, controlled, supported and subsidized. In just 2 recent trade cases the Commerce Department determined that Chinese steel pipe producers were benefiting from below market subsidized electricity. Increasing electricity rates would put U.S. producers at an even greater disadvantage.

Additionally, the EIA analysis does not take the entire suite of proposed or pending EPA regulations of the utility sector into account. Compliance with some of these regulations will work across purposes to a CES by requiring technologies that reduce energy efficiency. If a CES moves forward better regulatory coordination and a rationalization of the multiple requirements, multiple regulatory requirements is something that should be examined.

AISI also believes that the benefits of domestic shale gas should be fully recognized in the CES program. Our industry consumes large amounts of natural gas. Will benefit from increased supply resulting from shale production which keeps gas both reliable and affordable.

Affordable natural gas is also allowing the industry to implement even more efficient and less carbon intensive steel making methods and processes.

Finally, we appreciate the recognition of industrial energy efficiency in the legislation. However, a CES should be broader and should recognize the energy efficiency investments made at facilities in recent years in addition to those improvements made prospectively.

In conclusion, AISI does not support the creation of a Federal standard for electricity producers because of the impacts on energy intensive, trade exposed manufacturers like steel. While the largest cost increases may appear far off in the future steel plants have long life capital assets. A steel plant cannot simply move to an area with an easier compliance burden and lower costs under a CES. A new facility built today will still be in service in 2035 and for decades beyond as will many existing facilities.

Further, market forces and other EPA regulations are already moving electricity generation away from coal and toward lower carbon fuels. AISI would support a comprehensive and market driven energy policy built around promoting greater development of all domestic energy sources, incentives for efficiency improvements and additional support for manufacturing industry efforts to develop breakthrough technologies. These policies would serve to meet shared national clean energy goals while avoiding the negative impact a CES would have on the manufacturing sector.

Thank you for your time today. Thank you for allowing me to testify. I look forward to your questions.

[The prepared statement of Mr. Gibson follows:]

PREPARED STATEMENT OF THOMAS J. GIBSON, PRESIDENT AND CEO, AMERICAN IRON AND STEEL INSTITUTE

Introduction & Industry Background

Chairman Bingaman, Ranking Member Murkowski, and members of the Committee, thank you for your invitation to appear today. I am Tom Gibson, President and CEO of the American Iron and Steel Institute. AISI serves as the voice of the North American steel industry and is comprised of 25 member companies, including

both integrated and electric arc furnace steelmakers. Our member companies represent over three quarters of both U.S. and North American steel capacity.

Steel and other manufacturing industries are the backbone of the U.S. economy. A strong manufacturing sector creates significant benefits for society, including good-paying jobs, investment in research and development, essential materials for our national defense, and highvalue exports. A robust American steel industry is critical to leading the domestic economy into recovery.

AISI is concerned about increased electricity costs and reliability issues that may result from additional regulation of the utility sector, including a national Clean Energy Standard (CES). The consumers of electricity will ultimately have the compliance costs and reliability risks passed on to them.

AISI recently commissioned a report by Professor Timothy J. Considine of the University of Wyoming on the industry's impact on the U.S. economy. Professor Considine found that the steel industry's purchases of materials, energy, and supplies for the production of steel stimulate economic output and employment in a range of sectors across the economy. Steel's economic contributions are multiplied many times over, with Professor Considine finding that every \$1 increase in sales by our sector increases total output in the U.S. economy by \$2.66. Additionally, he found that every individual job in the steel industry supports seven additional jobs in other sectors of the economy. In aggregate, the steel industry accounts for over \$101 billion in economic activity and supports more than 1 million jobs across the country. A copy of that study is attached to my testimony and I request that it be made part of the hearing record.

Like the rest of our economy, the steel industry is recovering from the depths of the recession but far from fully recovered. As we near the midpoint of 2012, there are positive signs that the economy continues on a slow but steady recovery, although subject to volatility—particularly related to the downturn in Europe's economy and the slowdown of the Chinese economy. AISI's latest estimate is for shipments of 97 million tons for 2012, which would be an increase of roughly 5 percent over the 92 million tons the industry shipped in 2011. Shipments of 97 million tons are only equivalent to our shipments in 1995, and represent only 90 percent of our five-year prerecession average shipments of 108 million tons.

Domestic capacity utilization rose to 79 percent in the first quarter, a 6 percent improvement from the previous quarter. Total finished steel import market share year-to-date is at 23 percent, and imports are increasing at a faster rate than our domestic steel market is recovering. The most recent Department of Commerce Steel Import Monitoring and Analysis data for the month of April recorded another sharp rise in finished imports to the highest level since October of 2008. We are very concerned about this trend and sensitive to policy changes that could make production here more expensive and less internationally competitive.

Steel & Energy

The production of steel is inherently energy intensive, and the industry consumes substantial amounts of electricity, natural gas, and coal and coke to make our products. In 2010 our domestic industry consumed 45.7 billion kWh of electricity. Energy is typically 20 percent or more of the cost of making steel and, as such, energy efficiency is key to our industry's competitiveness.

AISI members are doing everything they can to increase energy efficiency, and we are leading the way by effectively setting the bar for steel industry efficiency worldwide. AISI members have made substantial gains in reducing their energy usage, as well as their environmental footprint, over the last two decades. The domestic steel industry has voluntarily reduced its energy intensity by 27 percent since 1990, while reducing its greenhouse gas (GHG) emissions by 33 percent over the same time period. In fact, data presented by the U.S. Department of Energy at a recent meeting of Global Superior Energy Partnership's Steel Task Group showed that the steel industry in the U.S. has the lowest energy intensity and second-lowest CO₂ emissions intensity of any major steel producing country.

While we approach the practical limits for efficiency using today's processes and continue to pursue incremental gains, AISI members are not resting on their laurels. We recognized in 2003 that in order to make any further significant improvement in energy use, new breakthrough technologies would be needed. It was at that time the industry began investing, often in partnership with DOE, in the CO₂ Breakthrough Program, a suite of research projects designed to develop new ironmaking technologies that emit little or no CO₂ while conserving energy. We have developed two key technologies to achieve those goals since that time, and they are now ready for pilot scale testing. The research is being done at MIT and University of Utah and both projects are the subject of proposals currently under consideration for DOE cost-sharing. This successful partnership with DOE, along with the

continued support of Congress, will accelerate the development and deployment of critical technologies such as these.

Concerns with S. 2146

A national CES imposes its direct requirements on the utility sector, not on its customers, but it is the customers that will bear the costs associated with compliance. Our principal concern is that this will inevitably raise the costs of electricity to large industrial customers like steel, while potentially lessening the quality and reliability of electricity supply. The analysis of S. 2146 performed by the Energy Information Administration (EIA) highlights key concerns about a CES raising the price of electricity to customers, and to large industrial facilities in particular. EIA projects that by 2035, national electricity prices will be 18 percent higher than the reference case. For industrial customers, the report concludes that electricity will cost 25 percent more under a CES than it otherwise would.

This economic impact will be exacerbated for the steel industry due to the regional differences in current fuel mix and the cost to switch to other fuels for the generation of electricity. EIA projects that S. 2146 will substantially reduce coal-fired generation. Compared with a reference case, coal generation would decline by 25 percent in 2025 and by over half—54 percent—in 2035. Thus, within two decades, the electricity generation infrastructure of the United States would radically shift from the fuel mix that has been in place since the advent of significant nuclear power generation around 1970.

Certain areas of the country are better suited for renewable production from wind and solar sources, while others have an abundance of coal sources. As noted above, creating a national CES will have a disproportionate impact on coal-fired utilities, and there is a high correlation between the service areas of those utilities and the location of steel production facilities. Industrial customers, especially steel producers, will be charged to offset the cost of replacing coal capacity with other sources, including the cost of new transmission infrastructure.

The two leading states in terms of iron and steel production in the U.S. are Indiana and Ohio, while other important states for the industry are Alabama, Pennsylvania, Kentucky, and Michigan. All of these states are heavily dependent on coal for electricity production, and in turn, so is our industry. EIA projects in its Annual Energy Outlook 2012 Early Release that by 2035, 39 percent of electricity generation will be from coal. In its analysis of S. 2146, it projects this percentage to drop to 18.7 percent in 2035, a result that will disproportionately impact the steel industry.

Legislative and regulatory policy measures that impact energy availability and reliability influence each company's competitive situation in a unique way. And, as also noted above, the domestic steel industry is subject to substantial international competition. In particular, this competition comes from nations such as China, where the industry is largely state owned, controlled, and subsidized. In two recent countervailing duty cases, the Department of Commerce determined that Chinese steel pipe producers were receiving below market rates for electricity, which constitutes a subsidy. For the steel industry, operating in the U.S. under tight margins with substantial subsidized competition from overseas, policies that raise energy costs on domestic companies threaten our ability to remain competitive.

Additionally, while the EIA does factor the Cross-State Air Pollution Rule ("CSAPR") into its analysis, it does not quantify the impact of other proposed or pending EPA regulations of the utility sector. These regulations, including the Mercury and Air Toxics Standards Rule, or "Utility MACT," greenhouse gas utility regulations, coal combustion residuals, and Clean Water Act section 316(b) cooling water intake structures, will all have an impact on coal-fired utilities, and therefore threaten the availability and reliability of electricity to large industrial customers.

If a CES were to move forward, EPA regulatory policies could act at cross-purposes. Some clean air technologies result in the consumption of additional energy and thus might act contrary to the purposes of a CES. Otherwise, existing electricity-generating infrastructure will face multiple retrofit requirements that are presently scheduled to occur at virtually the same time. For example, the second, more stringent phase of CSAPR is scheduled to be implemented in 2014. This rule affects 28 states overall and the second phase of the rule is targeted on 16 states in the Northeast and Midwest, the industrial heartland of the United States. Beyond that, the Utility MACT rule imposes new controls on existing powerplants in 2015 and 2016. These requirements are mandatory; a facility cannot operate unless it complies. Finally, newly proposed greenhouse gas rules for powerplants would effectively require that natural gas be used for all new generation. This requirement will further shift our nation's generation from coal to natural gas and other power sources.

This situation, at minimum, requires better regulatory coordination and a rationalization of multiple, new requirements. It could also, under certain circumstances, justify preemption for overlapping requirements. While some emission control requirements are complimentary—for example, improved or additional fabric filters can help reduce particulate matter emissions and mercury—this is not always the case. We may therefore need to determine in different situations whether renewable energy policy should take precedence over certain Clean Air Act goals or vice versa.

AISI also believes that the benefits of domestic shale natural gas production should be fully recognized in a CES program. We are encouraged by the discovery and production from shale formations. Affordable natural gas is presenting both integrated and electric arc steelmakers with new options for how to make their products more efficiently. As a significant consumer of natural gas, it is important to have gas supply be both affordable and reliable. And it provides expanded markets for steel pipe and tube products that are essential to the production and transmission of natural gas and oil. The advent of shale gas production in the U.S. has the potential to be a “game changer” for domestic manufacturing, and should not be ignored when creating a low-carbon energy policy.

Finally, we appreciate the recognition of the importance of energy efficiency in the legislation and believe that efficiency measures from manufacturing industry facilities should be fully qualified in a CES program if the bill were to move forward. There is potential for steel production facilities to qualify as energy efficiency producers, either through new CHP capacity, wasted heat and byproduct gas recovery and conversion, or demand response mechanisms, such as reductions in peaking. All of these efficiency opportunities hold great potential for industry, and should be fully included in CES legislation that provides incentives for renewable energy production. However, a CES should recognize the efficiency investments made at industrial facilities in recent years in addition to those improvements made moving forward. As noted above, the steel industry has improved its efficiency by 27 percent over the last two decades. Legislation that does not provide credit for recent efficiency projects ignores the energy and environmental benefits realized from these investments.

Conclusion

AISI does not support the creation of a federal standard for electricity producers, because of the disruptive economic impact to the energy-intensive, trade-exposed manufacturing sector that will occur to satisfy CES requirements. While the largest cost increases may appear far off in the future under EIA’s analysis, steel plants are long-lived capital assets. A steel plant serviced by a utility that is disadvantaged by the bill cannot simply move to an area with an easier compliance burden and lower costs. A new facility built today will still be in service in 2035 and for decades beyond, as will many existing facilities.

It is also essential to recognize that EPA’s regulatory agenda for the utility sector, coupled with relatively affordable natural gas supply, is causing numerous utilities to take steps that will ultimately reduce their emissions levels without a CES mandate. In the recently proposed greenhouse gas requirements for new powerplants, EPA bluntly declared that the rule would not impose costs on the utility sector since the agency saw little or no coal generation being built for the next two decades. While this prediction has been strongly criticized as being self-fulfilling, it is clear that EPA anticipates the proposed greenhouse gas rules and other Clean Air Act rules will result in both near-term and longer-term reductions in emissions from the electricity sector. EPA regulations, along with market forces from affordable natural gas, are already causing a shift from coal- to natural gas-based electricity generation. Coal was last above 50 percent of U.S. electricity generation in 2008. It is now at 45 percent, and projected to continue to decline to 39 percent by 2035 even without a CES in place.

AISI does believe that Congress should craft a comprehensive and market-driven energy policy built around promoting greater development of domestic energy sources, incentives for efficiency improvements, and additional support for industry efforts to develop breakthrough technologies. These policy measures will serve to meet shared national clean energy goals, while avoiding the negative impact a CES would have on the industrial sector. In particular, such an agenda should create an abundant and affordable energy supply by developing domestic oil, natural gas, nuclear power, and clean coal resources and fully make all these sources of energy part of the nation’s energy independence strategy moving forward.

Thank you very much for your time today, and I stand ready to answer any questions the Committee may have.

The CHAIRMAN. Thank you very much.

Mr. Trent.

**STATEMENT OF KEITH TRENT, GROUP EXECUTIVE AND
PRESIDENT, DUKE ENERGY COMMERCIAL BUSINESSES**

Mr. TRENT. Good morning, Chairman Bingaman, Ranking Member Murkowski and members of the committee.

The CHAIRMAN. You might be sure that microphone is operating.

Mr. TRENT. Thank you. Got it, thank you very much. Sorry about that.

I do have my thanks for the opportunity to testify on S. 2146. I'm Keith Trent and as Chairman Bingaman mentioned, I lead Duke Energy's commercial businesses. Those businesses include a mixture of around 12,000 megawatts of coal, hydro, natural gas, wind and solar energy.

In addition to the commercial businesses, Duke Energy has a whole, operates around 35,000 megawatts of generation. We are also the third largest nuclear operator in the United States. So we have a very broad and diverse portfolio of generation assets.

That diverse portfolio gives us an insight into the economics and competitiveness of each of these technologies and fuels. S. 2146 is important because it advances a dialog that we need to have about our Nation's future energy mix. We support the committee's efforts to establish a policy that encourages the most promising energy technologies, promotes fuel diversity and sparks job creation.

I would say that this discussion could not come at a more opportune time.

Our industry is on the cusp of a massive investment cycle. Aging plants, some of which are more than 50 years old are retiring as tighter environmental regulations go into effect. Very low natural gas prices are making many of these plants less economically viable even today.

I'll give you an example. In the Carolinas our natural gas plants are dispatching right after our nuclear plants today and before even our most efficient coal plants. That's something that we would not have even imagined a couple of years ago.

So older coal plants are clearly struggling today.

While low natural gas prices may sound like very good news for the economy, we know that historically natural gas prices have been very, very volatile. We fully expect that that volatility is going to continue in the future. For example, just as recently from April to today, natural gas prices have gone up 30 percent.

A well crafted clean energy standard can and should accomplish several goals.

First, it should encourage the development of a diverse mixture of fuel sources and technologies.

It should fuel job growth and the wind and solar sectors helping to address the uneven Federal support that has contributed to the spasmodic growth for those industries.

A Clean Energy Standard should give emerging clean coal technologies an ability to move forward. We know that clean coal technology is the key to the future viability of this fuel.

A Clean Energy Standard should be supportive of our only zero emission base load technology and that's nuclear power. With ex-

panded Federal support the nuclear industry can be a major economic growth engine while supplying emissions free generation.

So what I'm describing here is the need for a diverse portfolio of clean energy, fuels and technologies, that can power America for decades. I believe that S. 2146 is aligned with those goals and does so without picking winners or losers.

There is one specific point of concern and it's a concern that I have not heard so far that I do want to raise to the committee's attention. The bill, as currently structured, gives new gas plants partial energy credit. I do have some concern about this, especially given the fact that gas already enjoys a very significant market advantage today.

To layer on an additional advantage it seems to us, encourages even more over reliance on a single fuel and very well could stymie investments in other fuels, in particularly in nuclear and coal.

Finally, I want to say something about cost. It's very important to Duke Energy that the cost to all of our customers be taken into consideration. We need to be especially mindful of the impact on those that are least able to pay.

Mr. Chairman, members of the committee, I commend your efforts to develop a long term, market based, energy strategy. America needs such a policy to drive innovation, fuel diversity and job creation. Thank you again for the opportunity to testify.

[The prepared statement of Mr. Trent follows:]

PREPARED STATEMENT OF KEITH TRENT, GROUP EXECUTIVE AND PRESIDENT, DUKE ENERGY COMMERCIAL BUSINESSES

Thank you, Chairman Bingaman, Ranking Member Murkowski, and the rest of the Committee for the opportunity to testify today regarding S 2146.

My name is Keith Trent and I'm Group Executive and President of Duke Energy's commercial businesses. Most people know Duke Energy as a service provider of electricity to more than 4 million customers in North and South Carolina, Indiana, Ohio and Kentucky. Through our commercial businesses, Duke Energy is also a large independent power producer that generates and delivers electric power and related services in deregulated energy markets.

Our domestic commercial businesses include more than 3,500 megawatts of coal-fueled generation in Ohio; more than 3,000 megawatts of natural gas-fueled generation in the Midwest; almost 70 megawatts of solar generation in Arizona, California, Florida, New Jersey, North Carolina, Pennsylvania and Texas; and by the end of this year, more than 1,600 megawatts of wind-powered generation in Colorado, Kansas, Pennsylvania, Texas, Wisconsin and Wyoming.

Duke Energy is the third-largest operator of coal-fueled and nuclear-powered generation in the country. Over the last five years, Duke Energy has invested approximately \$10 billion to build new cleaner coal, natural gas, wind and solar power plants. In addition, we are pursuing a license with the Nuclear Regulatory Commission to build a new nuclear power plant in South Carolina. Building and operating such a diverse portfolio of power generation assets affords us valuable insight into the economics and relative advantages, drawbacks and competitiveness of each of these important energy technologies and fuels.

We are pleased to testify today on this important proposal to spur clean energy in the United States. It advances the dialogue about how to create jobs and power our nation throughout the 21st century and beyond. The challenge we face every day at Duke Energy involves balancing the need for affordable, reliable and clean electricity. The bill addresses this imperative. We are supportive of the Committee's efforts to establish a policy that supports the most promising energy technologies, values a diverse mix of power generation fuels, and enables sustained job creation.

The electricity sector is on the cusp of a massive, new investment cycle. Out of approximately 300,000 megawatts of coal fueled electric generation in this country, about 100,000 MW is as old or older than most of us in this room. Compared to newer power plants, these older units—predominantly coal-fueled—are generally smaller, less efficient and more expensive to run. They typically have higher emis-

sion rates of sulfur dioxide, nitrogen oxides and mercury, and are therefore most vulnerable to stricter environmental regulations. It is projected that between 30,000 and 60,000 megawatts of the country's aging coal-fueled generation fleet will be retired by 2015 or shortly thereafter to meet existing and new environmental regulations.

Plummeting natural gas prices are also clearly threatening the viability of these plants. Natural gas prices have not been this low since the mid-1990s, although the 30 percent increase we've witnessed over the last month serves as a reminder of the fuel's historic volatility. Still, at around \$2.50 per thousand cubic feet, and with prices predicted by many experts to remain low, it is reasonable to expect that most of the coal-fueled units to be retired will be replaced with gas-fueled units. Gas producers tell us not to worry. There's plenty of gas, they say, and prices will stay low.

Electric generating plants are built with the expectation they will operate for over 40 years. Given this long term investment horizon, I believe putting all of our eggs into one basket—one that is very attractive today but has a history of volatility—would be imprudent and short-sighted. Moreover, this path would result in a massive appetite for natural gas from the power industry, putting upward pressure on natural gas prices. Understandably, this makes other natural gas users—like chemical manufacturers, fertilizer producers, and in the Carolinas, textile companies—very nervous. There are also serious proposals to shift heavy-duty trucking from diesel to natural gas. Gas is currently cheaper than diesel and, using analysis from the EIA and RFF, this shift could reduce our oil dependence by up to about 800 million barrels per year, or roughly 25 percent of our oil imports.

S 2146 as currently structured gives new gas generation partial clean energy credit. We have concerns with the concept of including natural gas in the program since it could lead to an overreliance on this single fuel. This is counter to policy goals supporting a diverse generation mix and, more importantly, investments in other proven and promising clean energy technologies. For example, construction of new nuclear units—which we know are highly competitive in the long run—and zero-emission wind and solar power plants will suffer if Congress gives natural gas another leg up. Important work on technologies like carbon capture and sequestration will also grind to a halt barring government support for particular projects. This technology is vital to coal's future.

It is essential to remember that power producers cannot start and stop construction of energy projects as public opinion fluctuates with the price of natural gas. A well-structured Clean Energy Standard can help achieve critical economic and environmental goals while enabling investment in a diverse set of energy technologies. These technologies will serve as an economic hedge that better positions the U.S. to remain competitive when—not just if—market conditions change again.

A new Clean Energy Standard for our country should focus on zero-emission nuclear power, renewables and technologies like carbon capture and sequestration that ensures the continued use of one of our most abundant resources—coal. In addition to the long-term benefits of diversification, investments in these diverse energy technologies will spur continued job creation across many segments of our industry, rather than just one.

The reemerging nuclear technology and construction industries serve as my first example. As we all know, component manufacturing and nuclear plant construction in the U.S. all but disappeared in the 1980s. Today new nuclear construction is putting thousands of Americans to work in building a single plant in Georgia. Technology companies are working to design new nuclear technologies in anticipation of a future boom in new nuclear demand. With expanded support at the federal level, the nuclear industry can continue fulfilling its potential as a major engine for economic growth.

A viable Clean Energy Standard would also fuel job growth in renewable energy sectors like wind and solar power. Uneven federal support has contributed to spasmodic growth in these technologies in recent years. Take Duke Energy's wind power business, for instance. This year we will install nearly 800 megawatts of new wind-powered generation—enough capacity to power nearly a quarter-million U.S. homes. But like virtually every other project developer, we have not yet announced a new wind project for 2013. Consistent policy support encourages sustained investment in zero-emission energy technologies like wind power, keeping skilled workers gainfully employed.

Finally, a Clean Energy Standard could help unlock billions of investment dollars that are poised to transform coal to a fuel that can be used far more efficiently and cleanly in the decades to come. Domestic and foreign investors are ready to make big investments in emerging technologies like carbon capture and sequestration. They just need an appropriate incentive to lower the technology's investment risks. A well designed Clean Energy Standard can provide that incentive.

I have heard the concern that a Clean Energy Standard is the wrong policy because it picks winners and losers. I believe this claim is a fallacy. A standard does two things. It sets a target for how much power must be derived from a basket of clean energy technologies. It also specifies qualifying criteria for those technologies. If it is structured correctly, the utilities, working with the states will decide how best to meet their obligations under a federal Clean Energy Standard, using the resources that are most appropriate. In deregulated states, technologies would be selected based solely on their relative competitiveness. In Arizona, solar power likely fits the bill. South Carolina could satisfy requirements by continuing to invest in nuclear power. The winners or losers allegation is only accurate if the Clean Energy Standard determines carve-outs for each technology, or it selects which company will supply the technology.

Duke Energy judges Clean Energy Standard proposals against the following criteria:

1. Affordability: How will it impact our rate payers? In these tough economic times, we need to be acutely sensitive to the impact of our policy on those least able to pay.
2. Are they market based—and do they allow the market to decide how much of what type of technologies to deploy?
3. Does the policy only incentivize technologies which are otherwise not being adopted by the market? Natural gas technologies are already preferred by the market—they don't need additional incentives. Including them weakens the policy's ability to advance and deploy alternative technologies and creates disparate regional cost impacts. Both of these unintended consequences are very problematic but easily resolved. Lower the targets and remove natural gas from the list of technologies that qualify for the incentive.
4. Does the policy keep alive and advance the deployment of technologies which the electricity sector broadly agrees are needed to lower future risks of fuel price volatility and new environmental regulations? We find the incentive too weak to advance carbon capture technologies, which most energy experts, including engineers and economists at the Electric Power Research Institute, MIT and other institutions agree is a vital technology. Without carbon capture technologies, there will be no new coal investments.
5. Nothing is free. Is the cost of the policy broadly shared by everyone, or do some states pay significantly more than others? Keeping these technologies alive is in the interest of the entire U.S. economy, yet the EIA analysis indicates wide cost differences throughout the country. Besides being unfair, this hurts the possibility the bill will be passed, increasing the chance our future goes entirely to natural gas.

The policy can be made even more affordable with the addition of supporting policies targeted to remove non-economic barriers to nuclear, CCS and energy efficiency deployment. Duke Energy would welcome the opportunity to participate in this process.

In summary, I commend the Committee for pursuing a Clean Energy Standard that strives to put the U.S. on a coherent path to investment and job creation. Spurring investment in a diverse mix of clean energy sources and technologies—including nuclear, renewables and cleaner coal—will go a long way toward improving our economic and environmental outlook.

I thank you once again, Chairman Bingaman, for your efforts to develop a long-term domestic energy strategy that creates a market-based incentive to deploy new technologies with minimal future fuel price risks and maximum job creation potential. I see a great deal in the legislation that benefits consumers, communities and the American economy.

The CHAIRMAN. Thank you very much.

Mr. Dickenson, you're our final witness. Go right ahead. Prepared Statement of James A. Dickenson, Managing Director and Chief Executive Officer of JEA, Jacksonville Electric Authority, Jacksonville, FL

**STATEMENT OF JAMES A. DICKENSON, MANAGING DIRECTOR,
AND CHIEF EXECUTIVE OFFICER OF JEA**

Mr. DICKENSON. Thank you for allowing me to testify today on behalf of JEA and its customers. JEA is a member of a large public power council, American Public Power Association, the Florida Mu-

nicipal Electric Association and our commitment is to provide highly reliable, reasonably priced and environmentally responsible electric service to our citizen customers. So thank you for giving them a voice today.

We are concerned that any national CES will create substantial competitive impacts between regions favoring those that are situated to take advantage of geographic assets that more readily support development of solar, wind and hydro power. Using national average cost impacts can disguise significant electric rate differences among regions. While applauding the inclusion of nuclear energy and partial credits for natural gas technologies in the proposed bill, the move away from existing coal generation, including JEA's will strand not only large capital investments but the Nation's abundant supply of a secure, domestic fuel that will instead be exported to other countries.

We're also concerned that the proposed CES is too aggressive. Most large scale electric generation projects take years to design, finance, permit and construct. Utilities throughout the country will likely be vying for the same resources and materials, manpower, financing and regulatory review time.

National energy polices should balance multiple goals including energy security, economic growth, electric rate cost considerations and the environment.

JEA's existing non-renewable generation capacity totals over 3,700 megawatts with 38 percent of that being coal and pet coke.

Fifty-two percent is combined natural gas and diesel.

JEA has continued to diversify and move toward closer, cleaner generation technologies by adding more natural gas and small scale renewables. JEA has also made significant capital investment to modernize environmental controls at its existing coal plants. We have reviewed and developed an additional analysis of the impact of the CES on our generation sources and on electricity cost implications for our customers.

We commend the basic framework of the proposed CES that will allow utilities to meet the requirement through the best possible combination of energy sources for each utility, in each region of the country. We have concerns that because of the limited resources in our particular region the cost to meet the CES would be higher for JEA and other Southeast utilities. We're not blessed with the substantial wind resources, elevation changes for hydropower options or intense sun and expansive open lands for high intensity solar installations.

To meet a CES in Northeast Florida we have access to limited biomass, solar and landfill gas capabilities. All of which we currently use. The potential for nuclear development and the opportunity to consume energy more efficiently is also available.

But JEA's approach to renewables has been cautious because of the comparatively high costs. We anticipate that the combination of proposed CES targets on our customer demand for energy would require significant additional nuclear and renewable generation resources. JEA would be unable to meet the requirements of the CES beginning in 2015 through its own resources and would have to rely on a combination of clean energy credit purchases and alter-

native capacity payments while working to replace the majority of our current generation capacity with other sources.

JEA customers are concerned about their utility costs. These concerns are amplified by the current economic environment. While our overall rates remain average for Florida utilities, our customers expressed concern about the absolute cost of energy and are often not understanding of the relative comparisons.

The total costs to JEA customers to meet the CES over the 20 years is estimated at an additional \$14 billion in combined energy replacement and alternative compliance payments, an increase over base costs of about 64 percent. The cumulative alternative compliance payments necessary to meet the CES would be an additional cost burden to JEA customers, who will be funding the development or purchase of replacement energy sources to meet the CES at the same time.

We urge reconsideration also of the method of distribution of the ACPs to return them directly to any contributing utility for restrictive investment in qualifying clean energy or energy efficiency projects.

JEA also recommends allowing utility sponsored customer energy efficiency programs and improvements to count toward qualified clean energy credits.

In summary, JEA is very concerned that the CES in Senate bill 2146 is too aggressive and too costly to electric consumers across the country, especially in our service territory.

Thank you.

[The prepared statement of Mr. Dickenson follows:]

PREPARED STATEMENT OF JAMES A. DICKENSON, MANAGING DIRECTOR AND CHIEF EXECUTIVE OFFICER OF JEA

My name is James A. Dickenson. I serve as Managing Director & CEO of JEA, a municipally owned electric, water and sewer utility located in Jacksonville, Florida. JEA is a not-for-profit, community-owned utility with an electric system that serves more than 400,000 northeast Florida customers in Duval and three adjacent counties. Thank you for allowing me to testify today on behalf of JEA and its customers. JEA is also a member of the Large Public Power Council ("LPPC"), an association of 23 of the nation's largest municipal and state-owned utilities, American Public Power Association ("APPA"), a service association for the nation's more than 2,000 community-owned electric utilities, and Florida Municipal Electric Association ("FMEA"), an association of 34 public power communities in the state of Florida. Our commitment is to provide highly reliable, reasonably priced and environmentally responsible electric service to our citizen-customers.

We are concerned that any national clean energy standard will create substantial competitive impacts between regions, favoring those that are situated to take advantage of geographic assets that more readily support development of solar, wind and hydropower. Using national average cost impacts can disguise significant electric rate differences among regions. While applauding the inclusion of nuclear energy and the partial credits for natural gas technologies in the Clean Energy Standard Act of 2012 ("CES"), the move away from existing coal generation, including JEA's, will strand not only large capital investments but the nation's abundant supply of a secure domestic fuel that will be exported to other countries.

We are also concerned that the proposed CES requiring large-scale phasing in over a short 20-year time frame is too aggressive. Most large-scale electric generation projects take years to design, finance, permit and construct and utilities throughout the country will likely be vying for the same resources in materials, manpower, financing and regulatory review time.

National energy policy should balance multiple goals including energy security, economic growth, electric rate/cost considerations and the environment. These factors should all be considered with no one goal being weighted too heavily, thereby creating an imbalance for energy production to U.S. consumers.

As background, JEA's existing non-renewable generation capacity totals over 3700 megawatts (MW) with 38 percent coal or coal/petcoke units, 16 percent combined-cycle natural gas turbines, 32 percent simple-cycle natural gas turbines and 14 percent natural gas/diesel turbines. JEA's resource mix is constantly evolving. JEA was heavily reliant on residual oil generation until the 1980s when it diversified its fuel mix to include natural gas and coal in order to reduce both energy costs and fuel supply risks for our customers. JEA has continued to diversify and move to cleaner generation technologies by adding natural gas simple- and combined-cycle turbines and small-scale renewables. We have constructed seven modern natural gas turbines since 2000. In the early 2000s, JEA was the recipient of a Department of Energy grant of over \$70 million dollars to build two innovative 300 MW circulating fluidized bed ("CFB") coal/petcoke units, the leading clean-coal, fuel-efficient technology just a decade ago. Those CFB units now represent 15 percent of JEA's generation fleet and we have been able to use them with coal, petcoke and biomass fuels. JEA has made significant capital investments to modernize environmental controls at its existing coal plants. JEA carefully balances the generation and dispatch of electricity based on the most cost-effective use of fuels while meeting environmental standards.

JEA has reviewed and developed an initial analysis of the impact of the CES on JEA's generation sources and on the electricity cost implications for JEA customers. JEA continues to model the CES and its impact on generation dispatch and associated costs.

My testimony today addresses our initial analysis of the effects of the CES on JEA and ultimately on our customers. I will focus on five areas: 1) CES qualifying clean energy resources that are practical options for northeast Florida, 2) modifications to JEA's generation mix and energy sources to meet the CES over time, 3) projected electricity cost impacts to JEA customers, 4) Alternative Compliance Payments ("ACP") and return to contributing utilities for designated construction of further CES qualifying resources, and 5) CES credit for energy efficiency programs. JEA supports clean energy generation that protects and enhances the environment while remaining cost effective on our consumers' monthly energy bills.

1) CES Qualifying Clean Energy Resource Options for JEA

We commend the basic framework of the proposed CES that would allow utilities to meet the requirement through the best possible combination of energy sources for each utility in each region of the country. However, we have concerns that because of the limited resources in our particular region, the costs to meet the CES are higher for JEA and other Southeast utilities. As I stated in written testimony in March 2009 to this Committee, when considering renewable energy from Florida's standpoint, as well as the entire Southeast, the available options depend very much on geography. In the Southeast, unlike the West, Pacific Northwest and Midwest, we are not blessed with substantial wind resources, elevation changes for hydropower options, or intense sun and expansive open lands for high-intensity solar installations. For example, the Department of Energy's ("DOE") nationwide study of wind resources shows that there are no significant on-shore wind resources in the Southeast, and only limited off-shore capability.¹

What we do have in Northeast Florida are limited biomass, solar and landfill gas capabilities, the potential for nuclear development and the opportunity to consume energy more efficiently. JEA has cautiously approached adding renewables to its generation fleet out of concern for the comparatively high cost, small production amounts and low capacity factors of the available options. JEA has had 10 MW of purchased power wind energy in Nebraska since 2005. That facility runs at a capacity factor of about 38 percent. JEA sells the energy on the grid and retains the renewable credits. JEA also purchases all of the output from a 15 MW (direct current) solar installation built in 2010 on 100 acres of JEA-owned land in Jacksonville. This modern solar farm operates at a capacity factor of 17 percent. JEA has a net metering policy to purchase excess power from certain customer-owned solar installations and has small-scale photovoltaic solar applications scattered throughout Duval County. JEA also produces or purchases 16 MW of landfill gas from Jacksonville's three local landfills and biogas from a JEA-owned wastewater treatment facility. Combined, these renewable energy resources represent roughly one percent of JEA's retail sales. As mentioned, JEA has been co-firing our CFB units with biomass material from tree trimming. JEA also continues to evaluate biomass ownership or purchase power options considering the availability of biomass fuel supplies, yet-to-be-determined carbon classification impacts and relative cost comparisons.

¹See <http://www.windpoweringamerica.gov/windmaps/offshore.asp>

JEA has a contractual commitment with the Municipal Electric Association of Georgia (“MEAG”) for 200 MW of purchase power in the new Plant Vogtle nuclear units 3 and 4 that should be available in 2017. JEA also has an option for an ownership interest of between 5 percent and 20 percent in the proposed Duke Energy William States Lee III Nuclear Station currently scheduled to be available in 2021-2022. JEA continues to evaluate other nuclear options.

2) Modifications to JEA’s generation mix and energy sources to meet the CES

JEA has continued to transition its resource mix toward natural gas baseload generation, to expand its access to intermittent renewable resources, and to diversify with new nuclear options. However, we anticipate that the combination of the CES proposed targets and our customer demand for energy would require significant additional nuclear and renewable generation resources above what is projected in our current long-range plans.

We have prepared a comparison between a base case projection to meet JEA’s energy demands over the proposed time frame (without CES) with a modified case to meet the CES (shown in Exhibit A). The results of this analysis were produced by a preliminary study and not by a full-blown integrated resource planning study (“IRP”). However, the results are a reasonable analysis of the choices we would likely make to meet the proposed CES.

Substantial additional nuclear generation would be the primary means to meet the CES. JEA would also add additional solar installations in 15 MW increments over an eight-year period early in the 20-year time frame and would build or purchase additional solar, wind and biomass energy. Even with an aggressive program of renewable and nuclear generation development, JEA would be unable to meet the requirements of the CES beginning in 2015 through its own resources and would have to rely on a combination of clean energy credit purchases and Alternative Capacity Payments while working to replace the majority of our current generation capacity with other sources.

Because of the large-scale output and high capital development costs of current nuclear design technology, JEA finds its only economic option for nuclear is to purchase power or to acquire partial ownership interest in nuclear projects. We remain interested in the ongoing development of Small Modular Reactor (“SMR”) designs and believe the commercial demonstration of SMR might make a local nuclear option more viable for JEA in the future. The SMR design is being incentivized by DOE at present through proposed funding agreements. Because nuclear plants would comprise a great percent of total capacity under the CES, new large-scale nuclear plant design and the developing SMR designs must allow for flexibility to lower the energy output of nuclear units during off-peak demand periods in order to avoid energy dumping.

JEA has not included new coal capacity with carbon capture and sequestration (“CCS”) in either our base case or the CES case. Although it has not yet been adequately demonstrated on a utility scale, we believe the technical and engineering obstacles to CCS may be solved with enough investment in research and development. Of course, the high costs and substantial energy penalties of CCS will continue to discourage investment by electric utilities. However, solving the engineering issues will not be enough.

The legal and regulatory barriers to sequestration of hundreds of millions of tons of CO₂ effectively forestall any serious consideration of CCS on a widespread basis by electric utilities. Although there may be adequate geological formations capable of accepting CO₂, we see no credible path to licensing large scale CO₂ sequestration. In Florida, there are no significant formations capable of sequestering utility CO₂. This means that an interstate network of CO₂ pipelines would need to be sited, licensed, financed and built. The siting alone would offer hundreds of miles of opportunities for obstruction. Those obstructions would likely include additional environmental concerns, permitting difficulties, and lack of confidence in protective, effective technologies.

JEA is also concerned that the CES, as written, will further drive our nation away from the economic use of our abundant coal resources. Today coal powers more than 40 percent of all electric generation in the United States. If coal is removed from our energy mix, the U.S. energy position will be both higher cost and less secure.

3) Projected electricity cost impacts to JEA customers

JEA customers, like those across the country, are concerned about their utility costs. These concerns are amplified by the current economic environment. JEA has had a series of rate increases over a seven year period to pay for capital construction financing and high coal and natural gas fuel costs. Due to the recent drop in natural

gas prices, we plan to reduce our pass through fuel cost to customers in July 2012 for the first significant decrease in overall rates since 2004. While our overall rates remain about average for Florida utilities, our customers express concern about the absolute cost of energy and are often not understanding of the relative comparisons.

Renewable and nuclear energy options are expensive, especially compared with the alternatives available today. As discussed earlier, renewables in Northeast Florida are limited in terms of output and availability and are far from sufficient to meet our customers' electric demands even with the addition of new projects.

Based on the CES case projected in Exhibit A, JEA would be able to meet the CES through a combination of resource development, credit purchasing and alternative compliance payments with an average annual energy cost increase of 4.6 percent above our base case over the first six years of the mandate. The cost premium is so low primarily because JEA has already committed to the new Plant Vogtle nuclear units. While a 4.6 percent cost differential seems relatively reasonable, our customers already protest any increases in costs. Neither our residential nor our commercial customers will readily accept the CES mandate as a good reason to raise rates. Even more troubling are the significant annual cost differentials (20 percent to over 100 percent) JEA customers will be asked to endure to meet the CES beginning in 2021. The total cost to JEA customers to meet the CES over the 20 years to 2035 is an estimated additional \$14 billion in combined energy replacement and alternative compliance payments, an increase over base case costs of about 64 percent.

4) Alternative Compliance Payments ("ACP") and return to contributing utilities

The cumulative alternative compliance payments necessary to meet the CES would be an additional cost burden on JEA customers who will be funding the development or purchase of replacement energy sources to meet the CES while also making the compliance payments. JEA is concerned that the ACP structure contained in the proposed CES would keep 25 percent of the payments in Washington, D.C. and return 75 percent of the ACPs to the states for distribution restricted to energy efficiency projects as the language is currently worded. This plan would likely penalize public power customers unless there was a formula directing the payments back to the contributing communities. The rationale for keeping 25 percent of the ACPs at the federal level appears intended to have the program remain revenue neutral to the federal government. However, JEA and other municipal utilities do not pay corporate income tax, and would receive no benefit from an expense deduction for ACPs. Thus the federal budget would not be harmed if 100 percent of ACPs paid by public power utilities were returned to the public power utilities.

Additionally, the ACPs may result in substantial sums of dollars directed solely to energy efficiency projects when for some utilities the development of additional clean or renewable resources might provide a greater benefit toward achieving the CES's stated goal of reducing carbon emissions. Flexibility to direct the dollars to qualified clean energy projects or energy efficiency upgrades would be a great improvement.

Rather than pay the ACP to the federal government, JEA proposes that each affected public power utility make this significant investment in qualified CES resources that directly benefit their communities. This would allow our customers, who are making the investment as a portion of their electric rate, to directly benefit from the payments. Thus, public power utilities would be provided the flexibility to develop more clean or renewable energy projects and energy efficiency upgrades, based on cost-benefit analyses. This method would result in a large investment in qualified clean energy and energy efficiency projects. In Florida, where renewable energy at reasonable costs is severely limited, such projects could include rebates for customer-owned energy efficiency and photovoltaic energy, as well as development of biomass projects.

We urge reconsideration of the method of distribution of ACPs to return them directly to any contributing utility, regardless of ownership structure, or in the alternative, return the payments to the contributing community-owned utilities, for restricted investment in qualifying clean energy or energy efficiency projects. We underscore the recommendation to allow the returned payments to be used with flexibility by the utilities and communities making the payments and to send the full amounts back to public power utilities or allow them to track the payments and qualifying expenditures, rather than remitting them to the government.

5) CES credit for energy efficiency programs

The ACP structure favors energy efficiency programs as currently proposed. JEA recommends allowing utility-sponsored customer energy efficiency programs and improvements to count toward qualified clean energy credits. An exception or deduc-

tion could be made for 10 those energy efficiency programs that are funded with returned ACPs as suggested in item 4 above.

Conclusion

In summary, JEA is very concerned that the Clean Energy Standard, as described in S. 2146, is too aggressive and too costly to electric consumers across the country, especially in our service area. The CES further isolates our country's abundant coal resources from being a viable source of energy production. It would require that large capital assets not only be scaled in over a mere 20-year period but would also require existing capital assets to be retired or abandoned before the end of their useful economic lives. All this cost would be borne by electric consumers—our customers, your constituents—in uncertain economic times. The ever-changing focus of environmental concerns and the long-term uncertainty of fuel availability and pricing impact a basic life resource that in part defines our quality standard of living.

The CHAIRMAN. Thank you very much.

Let me start with a few questions to the panel.

I guess one question occurred to me from your testimony Mr. Gibson. In your conclusion of your testimony you say it's essential to recognize that EPA's regulatory agenda for the utility sector coupled with relatively affordable natural gas supply is causing numerous utilities to take steps that will ultimately reduce emissions. Then essentially you say that this, in your view, is adequate, that it's clear that EPA anticipates the proposed greenhouse gas rules and other Clean Air Act rules will EPA anticipate—will result in both near term and longer term reductions.

One of the impetuses or a major impetus for trying to develop a clean energy standard was that a lot of economists have testified to us that they thought we should try to have a market based mechanism for improving the environmental performance of our generating capacity. That it should not be driven by Washington through EPA regulation.

Mr. GIBSON. Right.

The CHAIRMAN. You seem to be saying that you think we should go ahead and back off and let EPA do this. Am I reading that correctly?

Mr. GIBSON. No, I don't think I'm saying that EPA should. I'm saying EPA is. Even the EIA analysis that was the subject of the first panel does not include utility MACT.

It does not include the EPA utility greenhouse gas regulations. It doesn't include 316B, the cooling water regulation. So we're going down now a parallel track of EPA regulating using its authority under the Clean Air Act for carbon and for other things. Maybe the utilities would be in a better position to talk about that. But I can talk about it from my industry because we're subject to the same type of regulations.

Then we're going to add on yet another layer of the market based system. Sometimes, as I noted, they can work across purposes. Some of the technologies you might have to install to comply with the mercury rule, to put on a scrubber of some kind, would have a parasitic load associated with it. That will reduce your energy efficiency.

So everybody is, you know, kind of looking at their own piece of the problem. There is not an overall approach to it. That's the concern.

Then the comment about with natural gas suddenly being a lot more affordable over the past 5 or 6 years since when we started this effort, that is already sending signals to the market. So that

was what I meant. I think I was really just trying to point out that we do have almost a parallel structure going on if you were to proceed with this and not take a look at the full suite of EPA regulations to decide which ones, which policy goals, are going to be achieved through regulation and which policy goals are going to be achieved through the market mechanism.

Right now you would have both if you passed the bill as it is now.

The CHAIRMAN. As I understand it, as far as greenhouse gas emissions go, EPA's actions so far, only relate to new coal plants going forward. They are not directly dealing with greenhouse gas emissions from existing coal plants.

I don't know if you have an expectation that they will continue to decline action in that area or whether in the future if we don't do something like a Clean Energy Standard they would determine that they should go ahead and act to deal with the problem themselves.

Do you have a view on that?

Mr. GIBSON. I have a view that EPA is going to continue to use its regulatory authority both on—first on existing facilities but I think the Administrator has testified that they will be looking into turn—excuse me, at new facilities. In due course they'll be looking at existing facilities as well.

The CHAIRMAN. I guess my point is if something like a Clean Energy Standard were enacted.

Mr. GIBSON. Right.

The CHAIRMAN. Signed by the President. It would be a pretty good argument at least, for why they do not need to regulate in the area of existing plants.

Mr. GIBSON. But, you know, respectfully I'd say a lot of the uncertainty that's going on right now is whether or not the Congress, the previous Congress, ever intended EPA to regulate using greenhouse gases using the Clean Air Act at all. You would have, if you were to pass this bill, you would have the opportunity to speak to that.

You would have the opportunity to rationalize and say no. This is going to be the primary method by which greenhouse gases are going to be regulated from utilities or possibly other stationary sources. So.

The CHAIRMAN. Mr. Trent, did you have any thoughts on any of this?

Mr. TRENT. Yes, first of all, I definitely agree with the premise that a market based approach is much better for us and the economy than a command and control or EPA regulation type of mandate. So I agree most definitely with that premise.

I also agree that I would encourage Congress to take an opportunity if they're passing a Clean Energy Standard to also send signals as to what we're going to have in terms of future regulations. I would urge you to pre-empt that field.

The CHAIRMAN. Alright. My time is up.

Senator Murkowski.

Senator MURKOWSKI. I'm going to follow on that line of questioning because what I was hoping from the panel was really pretty much a straight up yes or down answer in terms of whether or not

you think it makes sense to pre-empt duplicative or potentially contradictory Federal greenhouse gas emissions under the Clean Air Act.

As Senator Barrasso was trying to drill down with the Secretary Sandalow. I mentioned it in my opening comments. About the fact that we've got kind of this series of overlap in terms of the regulations that are out there.

That my hope would be that we can figure out how we prioritize. So in the event that a CES similar to what Senator Bingaman has advanced or something else were to move forward, were to become law, do you think it makes good sense to allow for a pre-emption of those Federal regulations that relate to the emissions?

We'll just start with you, Mr. Dickenson. Mr. Trent, Mr. Gibson, you should be quick and easy on this.

Mr. DICKENSON. Thank you. I do believe that, you know, the compounding really creates an effect that we're all trying to keep up with. You know, right now we are responding to the NSPS rule that's come out on greenhouse gases.

On one of those I do believe that it's very unusual for EPA to commit with that and say they're only going to do it for new plants because the history has always been it includes that. Then there's also the legal issue, I believe, that's involved when you get into PSD permits that I think, once that rule came out I think they'll be sued, you know, by the environmental agencies or the environmental people. They will—and when that gets to court they'll find out that they have to go back and include, you know, existing plants in that regulation.

So I think that's what we'll see happening.

Senator MURKOWSKI. Mr. Trent? Pre-emption?

Mr. TRENT. Yes, I think that there are different legislative models to achieve our goals but I think the legislative vehicle is the right vehicle. I would say that the legislation should pre-empt.

Senator MURKOWSKI. Mr. Gibson.

Mr. GIBSON. Yes, I think it should pre-empt. You know, when I said in answer to your previous question about whether EPA is indicated. I'm not sure on that. I probably should have put words in Lisa Jackson's mouth.

But my expectation is eventually EPA will get to the existing sources. So I think your question was do I expect existing sources to be brought into the system. It's my expectation that existing sources will be brought into the system.

Senator MURKOWSKI. Mr. O'Mara.

Mr. O'MARA. I don't believe that it should pre-empt. I think the reason is that the Tailoring Rule, in particular is much broader than just energy generating units. So unless we're going to have a legislative solution that's economy wide, which I don't think is likely in the near term, allowing EPA to continue in, I think, the broader part of the economy I think is critical to meet the reduction targets that we've all established.

Senator MURKOWSKI. I'm going to come back to you on the State regulation side.

Ms. Greenwald.

Ms. GREENWALD. Yes, I mean, I don't have a yes or no for you. I do think that there are—a lot of us would be open to that con-

versation. I think it depends on the environmental effectiveness of the ultimate outcome of this process. If you had a very strong CES that was very environmentally strong and you could be confident that the outcome from that would be better than what EPA could do under specific authorities that might be a conversation to have.

One would have to be very cautious. We certainly would be because as my colleague here said, EPA has a broad authority under the Clean Air Act for greenhouse gases. This is a proposal just about the power sector. So you would have to be very careful and targeted and thoughtful to make sure that in the end the environmental outcome would be superior. That that would be the nature of the kind of conversation I think people might want to have.

Senator MURKOWSKI. Dr. Palmer.

Ms. PALMER. I want to echo what Mr. O'Mara said in that if you're going to—and Judi as well, that if you're going to pre-empt in this respect, the Clean Air Act, you need to just focus on the electricity part because of course, this is only addressing the electricity side of things.

I also think that just with respect to the Clean Air Act that there are a number of different ways that things could proceed with respect to regulating existing sources some of which might be more efficient than others. Might be able to grab some reductions in early years while this policy kind of ramps up. Because in the early years the Clean Energy Standard is easily met by the current, existing fleet because it's substantially below what the Clean Energy share is currently.

So there might be some timing issues here related to pre-emption.

Senator MURKOWSKI. Let me, I'm not going to go back to you, Mr. O'Mara. Instead I'm going to ask Mr. Trent and Mr. Dickenson here.

We're all concerned about the ultimate cost to the consumer here. You represent utilities there with Duke Energy and there in down in Florida. What—how do we protect the consumers from any significant rate increases here?

In the last Congress when we moved out a 15 percent renewable electricity standard that gave the Secretary of Energy some discretion to waive certain requirements if the incremental cost of compliance was in excess of 4 percent. I think ultimately this is what we need to be looking to. This is what folks around the country are going to say is what does this mean to me and my family?

So how do you deal with that aspect of this legislation and the fact that it's going to increase your costs?

Mr. DICKENSON. I'll say, I think it will. We've looked at—we've done an analysis on this in the brief time that we had. It wasn't a full IRP or integrated resource plan to look at the total cost to us, but we did, kind of, compare a base case generation verses what we would have to do under this act. It is a significant cost increase.

I mentioned over that period of time it's a 64 percent.

Senator MURKOWSKI. Sixty-four percent.

Mr. DICKENSON. Against our base case. That's our generation costs, not our rates. Generation today makes up about 70 to 75 percent of all of our cost. So it would be roughly, maybe, you know,

70 percent of that 64 percent, maybe somewhere around 40 percent or 45 percent.

Senator MURKOWSKI. If I'm down in Jacksonville and I hear you say that you're going to see a 64 percent increase. Again, I'm wondering well, what does that mean to me?

What's your answer to me?

Mr. DICKENSON. Right now they don't want any increase because I've already increased it quite a bit over the last 8 years because of fuel volatility and, you know, the piece is so—but it would be an increase.

I believe that one thing would be that you could look at a longer timeframe. 20 years is just a short timeframe in this industry. So a longer timeframe would allow more time to comply which would spread the cost out over a longer period of time, but.

Senator MURKOWSKI. Mr. Trent, real quickly.

Mr. TRENT. Yes. So we've constantly balanced 3 things, affordable, reliable and clean. We do that all the time.

The reality is prices are going up regardless of what we do because we're replacing a lot of old assets. But it's a very, very important issue. I think there are a few things here that help.

One, a market based strategy I think, reduces pricing giving the industry a long term certainty in terms of what we're supposed to be thinking about gives an ability to, I think, keep prices lower.

The alternative compliance payment that's embedded in here, I think, can serve, I think, to have some impact on pricing.

Then one thing that we've supported in the past in the Carolinas, for example, we have a renewable energy standard. There we actually put in an economic out that basically if the cost of compliance reached a certain amount for a customer class that the compliance would be suspended until those go down.

So I use that not as to say that ought to be inserted, but as an example of tools that I think can be used to mitigate costs. But at the end of the day I think we also have to recognize that if you're going to have clean as a goal, you're going to have some costs associated with that.

Senator MURKOWSKI. Have you done the internal review? I mean, Mr. Dickenson has mentioned that their study indicates a 64 percent increase. I'm assuming Duke is looking at similar cost runs?

Mr. TRENT. Yes. I have not done—we have not modeled this recently. We did model it many months ago. But the reality is the market has changed so dramatically that I really can't tell you what cost impacts, specifically, we would have in our jurisdiction.

What I can tell you is that that is something we absolutely would want to do and would do and would want to have further conversation with the committee on that point.

Senator MURKOWSKI. Thank you, Mr. Chairman.

Thank you, all.

The CHAIRMAN. Senator Franken.

Senator FRANKEN. I want to agree with Senator Coons and Senator Shaheen about energy efficiency.

Obviously the cheapest unit of energy is the unit of energy we don't use. We did something in Minnesota when we did our renewable energy standard 25 by 25. We established in an energy efficiency resource standard. What it basically said was the utilities

had to—were responsible for decreasing the efficiency of their users by 1.5 percent per year.

What that ended up doing was it had the utilities encourage their users to be more energy efficient and in some cases even incentivized the utilities to finance retrofits of some of their users. It was kind of, everybody likes it in Minnesota, it turns out. I think, I'm not—there might be some utilities that don't. But the utilities that I have talked to seemed to do that.

So I believe that an energy efficiency standard does, in part, modeled after some State programs is something that the committee ought to explore.

I think energy efficiency is a fairly bipartisan issue. I invite my, ah well, my colleagues on the other side of the aisle to consider this.

[Laughter.]

Senator FRANKEN. Can either Dr. Palmer or Ms. Greenwald talk about the potential energy savings that could be derived if the country moved toward a unified energy efficiency goal?

Ms. PALMER. I agree that an energy efficiency resource standard has some valuable provisions because it's creating a standard and it's making use of the market. I think that's important. There have been a lot of experiences from around the country that we can learn from in that regard.

I think that keeping the energy efficiency piece separate from the Clean Energy Standard would probably be preferable. Because whereas we can pretty effectively meter generated electricity, it's difficult always to measure exactly what the savings are from particular investments. There's a lot of differences across the States with respect to how they do that even for a common sort of investment.

So I think there's a lot of—that work that needs to be done there with respect to understanding that better.

I also think though that the use of the ACP revenue to fund energy efficiency while as an economist I should say there may be better uses for that revenue. If you were going to use it to fund energy efficiency there are big opportunities here. I mean in our modeling we find substantial amounts of money might be raised through ACP payments.

The type of opportunities I'm talking about is experimentation with particular types of policies and opportunities to really do real controlled experiments where you can effectively measure the affect of the policy verses the affect of folk's proclivity to adopt energy efficiency.

Ms. GREENWALD. Yes, I agree that we have a lot of experience at the State level to look to. About 19 States have an EERS that is separate. Another 8, include energy efficiency as part of their alternative energy portfolio standard or renewable portfolio standard.

So States have taken a variety of approaches to this. So we can look at that to get experience. Experience has been good.

They've achieved savings and energy efficiencies. Generally your first choice because of all the energy options it's the cleanest. It involves the least trouble in terms of citing. You know, any decision that you have to make on the supply side energy efficiency is helpful.

A couple of other points I want to make on energy efficiency. I think it relates to the cost issue that's come up a few times. We're guilty of this too.

We can't just focus on rate impacts. We have to focus on what happens to people's bills. People pay rates times how much they use and that's how you get a bill.

So if we can get enough efficiency and that can offset the rate increases. So that in the end the impacts can be much less.

Senator FRANKEN. Oh, yes.

Ms. GREENWALD. Sometimes even be positive. So I hope that as we go forward in this discussion we make sure to look at the actual bill impacts and not just focus on the rates.

I also think it's important and I'll echo what Karen was saying about Senator Bingaman and your proposal that there are a lot of incentives already in for efficiency which we think are very positive, the incentive for CHP, the using the ACP payments to fund energy efficiency programs. Also energy efficiency inherently will help you comply because it will reduce the overall amount of electricity that's needed. This is calculated as a percentage of that.

So you will need to do less to meet the standard if we do more energy efficiency.

So there are already incentives built in. So I think you can think about them separately. You can combine them if you want. There is experience to draw on.

But you can keep them separate. Then you can avoid this problem where they're a little bit hard to make equivalent because a savings in one part of the country could be very different from another. The baseline issue, establishing baselines around the country is tricky.

So having a different approach for each type, for efficiency on the one hand and renewables and other supply side options that are clean makes sense to us.

Senator FRANKEN. The energy savings from these retrofits can be startlingly high and bring down usage by the same kind of percentage.

I realize I've run out of my time. I just want to put a word in for combined heat and power which again, Senator Shaheen was talking about and also district energy.

In St. Paul we have a combined heat and power facility that is fueled almost by biomass and it heats downtown St. Paul. District energy, I think, we need to be considering what piece of all this where it might fit.

Thank you, Mr. Chairman for your work on the CES.

The CHAIRMAN. Thank you.

Senator FRANKEN. I thank you witnesses for testifying.

The CHAIRMAN. Senator Coons.

Senator COONS. Thank you, Chairman Bingaman. I'm just going to continue Senator Franken's dialog if I could on energy efficiency.

Initially Senator Shaheen and Senator Franken have been great leaders and partners on implementing energy efficiency. Working with you, Mr. Chairman, in trying to sort of, press forward the things that all of us in our experience prior to our coming to the Senate, saw. So, since we got through 2 steps down the panel.

If I could Secretary O'Mara, thank you for your testimony about the very real success that you and Governor Markell have had in Delaware in implementing broad changes.

If you could first just start by talking a little bit about energy efficiency. You referenced in your opening testimony that you wish we'd move more aggressively or actively in this bill to incorporating energy efficiency rather than studying it. There's a variety of different ways that measurement, monitoring and verification, MMV are possible around energy efficiency.

Do you see ways that MMV efforts could be put on the table to strengthen the energy efficiency components of a CES? What signal do you think the inclusion of energy efficiency within the CES would send to the market more broadly in terms of compliance costs?

Mr. O'MARA. When a lot of States were developing these policies originally the RPS was kind of the fad at the time. They nearly kind of ran from 10 percent or to 20 percent. Delaware is 25 percent.

Then at the same time you have this parallel conversation about efficiency. Then the efficiency standards and Delaware is a standard of 15 percent by 2015.

The challenges that it makes us look at different supply alternatives as separate. What it does is that you see a slight increase in prices from the RPS because these technologies are a little more expensive. You see a price decrease from the efficiency side. If you net them out there's actually more of a cost savings if you put them together.

I think the committee can actually learn from the experience from the States. Say, you know, by putting them together from the beginning that we're going to do everything in our power to reduce overall costs while still achieving pretty aggressive, environmental goals.

In Delaware under Governor Markell's leadership we have been focused on the outcome. The outcome of these studies everyone wants clean air, as clean as you possibly can have within the State. It's a challenge with 90 percent of our pollution coming from over the border, as Senator Carper has told you both. At the same time having bills actually go down overall.

You know, it seems like I could say it's Faustian choice, if you will. But it's not. You can actually do both.

I think if we sent a strong signal through the legislation that rather than studying it for years that you would like a national EMMV standard established by the Secretary that if they are going to be crediting immediately. I would include anything that displaces electrical demand including CHP and co-gen and district heat and solar thermal and biomass thermal that that will count toward the credits. The signal that it sends is that we are going to, as a Nation, treat energy efficiency as a supply resource just as we would any other type of energy.

At the same time that the Congress is sending a strong signal that energy efficiency is going to do more to lower our bills and estimates for it as much as 16 to 30 percent of overall energy consumption could be reduced in this country through energy effi-

ciency measures. All of which are cheaper than the least costly, traditional generation source.

So I think that overall it takes the EIA conversation we had earlier today whether it's 18 percent and it's \$5 savings or this and that. We wouldn't be having any of that conversation if we had it in it from the beginning because everyone would be saving substantial amounts of money if efficiency was a big part from day one.

Senator COONS. Thank you.

Mr. Secretary, as you well know, in the State of Delaware we have a functioning steel mill. We have a well refinery. We have heavy industry. We've also got cutting edge technology.

You referenced in your opening statement that we just did the ground breaking on Bloom Energy, a solid oxide fuel cell company headquartered in California that's going to be doing manufacturing in Delaware. We also hope at some point to have offshore wind have one of its first major installations off the Atlantic Coast in Delaware.

Talk a little bit more, if you would, about how you and the Governor created an environment in Delaware where all these different separate and disparate interests were able to participate and then given some of the previous testimony about regional concerns that I think are legitimate. Some concerns other members of the panel have about regions within the country how this national combined approach might learn from Delaware's experience in getting all the different stakeholders to have some role to play in a more positive clean energy future.

Mr. O'MARA. I think it really starts with the Governor's commitment to focusing on the outcome and looking at facilities as individual units. I don't think there's a single regulation or a single policy that's going to allow this transition to easily occur.

You know, we had legacy coal units that really needed to be updated and needed modern controls.

We had units that really should be fuel switched to use natural gas.

We had, you know, units that could have been co-gen or even upgraded to combined cycle.

So we actually approached it as, even as a—I represent part of the regulatory side, but all these products is almost like a public/private partnerships. In some cases it was helping in financing. In some cases it was small grants. In some cases it was expedited permitting.

By really focusing on the outcome instead of saying, you know, we're trying to reduce emissions of this facility by a certain amount now let's come up with the best way to do it. Not saying that government—I don't think government has the best answers on the prescriptive side. I think if government can set the standard and work with the various utilities to do it, to achieve that outcome, you can achieve great things. We've seen great work whether it's with the refinery or with energy or with Calpine and the different facilities in our States as a result.

Senator COONS. Thank you, Mr. Secretary.

If I might, Mr. Chairman, one last question?

The CHAIRMAN. Go ahead.

Senator COONS. As we discussed briefly yesterday I've discussed with a number of members of this committee. I've been asking my policy folks to find me some way to provide a tax advantage financing for an all of the above, don't pick winners and losers, path forward. We've been looking at different existing financing vehicles.

Master limited partnerships have existed, I believe, since the '86 tax bill. Are a tax advantage way, largely to finance pipelines, but they're also an extractive technologies of different kinds, but mostly oil, gas and pipelines. I've suggested to a number of my colleagues that we consider opening that up which would be a fairly simple statutory matter to other power generation and distribution technologies.

If we really mean that we want an all of the above, don't pick winners and losers, energy strategy and one that is demonstrated and sustained and well known in the marketplace, this might be one way to move. I'd be interested in whether any of the members of the panel have a brief comment in response given that I understand we have votes on the floor beginning any moment.

So I'd be interested in anyone's input on master limited partnerships.

The CHAIRMAN. I think the votes began about 5 minutes ago. But go right ahead.

Senator COONS. Sorry.

Mr. TRENT. I am familiar with master limited partnerships on the pipeline side and the midstream side. We have, at times, struggled with the fact that we couldn't take advantage of that, especially on the renewable side. So I think it's a good idea.

To be honest with you I haven't studied it enough to know if there are nuances that might impact my view on it. But my initial reaction, I think it's a good idea.

Senator COONS. You think utilities might take advantage of it as a financing vehicle?

Mr. TRENT. I don't know if it would be utilities, per se or people on the competitive generation side. But I think it's possible that we could take advantage of it.

Senator COONS. Sir? Mr. Dickenson.

Mr. DICKENSON. I'd just say on tax exempt issues being a large public power company which is what we are, we don't pay Federal taxes. But I think if you found a way there would be ways you could find to make things comparable for public power companies that would have some of the same incentives that investor owned who do pay those taxes. So I believe that would be helpful to be able to do that.

But you'd have to find a way to bridge that.

Mr. O'MARA. We think it's a fantastic idea particularly for utility scale projects.

Senator COONS. Thank you, Mr. Secretary.

Ms. GREENWALD. I don't have a particular view on that option. But we do think that we should be thinking about complementary policies that help all of these technologies become more cost effective. We don't know which technology is going to win under this proposal.

But the more that they can be incentivized to get over that early hump where they're not quite ready for market. The more we can

get a few going. The better and then the more cost effective the ultimate outcome is because then everyone has more options to choose from.

Senator COONS. With that, Mr. Chairman, one of the things I'm grateful for about how you've structured this Clean Energy Standard and how you've led this committee is that you've been open to an all of the above strategy and to finding ways to achieve American energy independence in a responsible way.

Thank you for this hearing.

The CHAIRMAN. Thank you for all your help with this Clean Energy Standard proposal.

Thank you all for your testimony. I think it has been very useful. I think the hearing overall has been very useful.

So that will conclude our hearing.

[Whereupon, at 12:06 p.m., the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSES OF JAMES A. DICKENSON TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. Please explain why you believe carbon capture and sequestration is not a viable option for Jacksonville Electric Authority (JEA).

Answer. We know of no proven carbon capture and sequestration (CCS) system or technology that provides a viable option for underground storage. We understand research and development in this area continues but for CCS to be viable, a methodology/technology would have to be 1) proven, 2) commercially available, 3) capable of large-scale application, 4) permittable through multiple entities and jurisdictional levels, 5) capable of surviving private environmental interest challenges, 6) sustainable—the solution must be long term, and 7) acceptable—the solution would survive public perception and opinion. Currently Florida law does not permit hazardous waste landfills. Depending on the future determination and classification of the stored matter, storage solutions for Florida may be out of state, offshore and therefore, more unpredictable. As an engineer, I believe we will eventually tackle the technology to capture and transport carbon. I have serious doubts that we will ever solve the licensing and public perception issues for long-term storage.

Question 2. You suggest that Alternative Compliance Payments should be returned to the contributing utility. Please explain your reasoning.

Answer. Utilities that are not able to meet customers' energy demands from available clean sources will be working to replace existing sources with clean sources. For JEA, that will require additional large-scale, multiyear, capital-intense projects or additional purchases of clean replacement power to meet a CES. Customer rates will be funding needed clean replacement energy through direct capital outlay or long-term financing. Additionally, while working to replace the sources, the alternative compliance payments (ACP) will act as a penalty on these same customers. Returning the ACPs to the contributing utilities or requiring utilities to account and spend any ACP amounts on qualified clean energy replacement sources will enable utilities to reach clean energy goals faster and at the same time will not penalize customers of those utilities working to comply with the standard.

If ACPs were self accrued, reported, accounted and restricted to qualified clean energy source investments for all utilities, there would be limited oversight and compliance effort required at the federal level. Perhaps ACP expenses could be excluded as an expense deduction for investor-owned utilities, maintaining revenue neutrality and eliminating the concern of revenue losses from corporate tax deductions. JEA as a city-owned utility does not pay corporate income taxes. The proposed 25 percent retainer of ACPs at the federal level would further penalize customers of municipal and not-for-profit utilities, especially if the return of ACPs to the states were not used to directly benefit the customers who contributed the payments through their electric bills.

Question 3. One issue that seems to be lost in the CES discussion is the needed transmission to get these new clean energy resources to load. In JEA's experience, how difficult is it to pay for and build new transmission? Also, in last Congress's Renewable Electricity Standard contained in S. 1462, we carried a provision that would allow the Secretary to request a variance from the mandate's requirements on the basis of transmission constraints preventing delivery of service. Is a transmission variance something JEA would support?

Answer. JEA has historically been successful in planning, acquiring and building new transmission corridors and transmission ties within its service area. New trans-

mission routes require multiyear planning, engineering, property acquisition, various government-level approvals and often required use of eminent domain to secure an entire route for construction. Understandably, routes in areas with more dense existing development are more difficult to acquire and therefore more costly.

JEA would support a transmission variance but does not support socialized cost allocation of new transmission to reach and deliver clean or renewable energy. JEA supports the use of clean energy credits in lieu of direct use or availability of clean sources. Since small-scale, energy-producing renewables are Florida's current viable option, and with the uncertainty of biomass energy being classified as clean or carbon neutral, most of JEA's current options would allow access to existing transmission. Larger scale nuclear project options include planning, provision and payment for transmission to access the energy.

Question 4. Do you believe a federal electricity mandate is necessary if there are incentives like a Production Tax Credit (PTC) in place? Conversely, does it make sense to have PTC treatment if there's a federal electricity mandate?

Answer. To force reduction of greenhouse gases in the United States, a federal mandate of some design may be required. However, the Environmental Protection Agency is issuing several rules, including GHG regulation of new sources and we expect regulation of existing sources to follow. If EPA is successful in implementing the proposed and anticipated rules, there is not likely a need for a CES. Conversely, a CES should negate the need for the EPA to mandate through regulation, especially with a proposed rule that shows no benefits and costs. By the way, I strongly support legislative action to pre-empt EPA regulation of GHGs.

More clean energy will likely be built with the availability of incentives like the PTC. However, traditional tax credit vehicles like the PTC are not available to JEA and other not-for-profit consumer owned utilities. Having the PTCs without a balancing incentive for not-for-profit utilities would continue to disadvantage public power. Alternative incentives could include modification of the Clean Renewable Energy Bonds (CREBs) program to remove the arbitrary volume cap and to instead provide an unlimited volume with a sunset date for the entire program that is the same as the PTC. To date, the CREBs volume cap has prevented utilities from financing entire projects with these bonds and thus public power utilities find it more economical to purchase power or partner with a private entity that can access the other programs. Another option is extend the currently expired section 1603 Treasury grant program and expand it to allow public power utilities access. The program would allow developers of renewable projects to basically convert PTCs into a direct grant payment equal to 30 percent of the project; it previously excluded public power. Use of the PTC, CREBS and section 1603 grants could help achieve a CES goal even earlier within an electricity mandate by offsetting some of the cost differentials between clean and traditional sources.

RESPONSES OF JAMES A. DICKENSON TO QUESTIONS FROM SENATOR CANTWELL

Question 1. I believe one of the most important parts of any energy or climate policy is protecting consumers from any energy cost increases that result from the policy. This is especially important for the lower and middle classes that spend a higher fraction of their income on energy. While I'm not convinced that some of the cost estimates accurately represent how prices of new technologies actually behave, I'm curious what, in your opinion, is the best way (other than energy conservation and efficiency) to protect the incomes of lower and middle income families as we transition to a clean energy economy?

Answer. Supplement and continue to fund LIHEAP and consider modifying the distribution formula to favor geographic regions that have fewer options for significant energy production from renewables. LIHEAP formulas already favor cold-weather states so there is a precedent for consideration of other disparities.

Question 2. Studies by the Congressional Budget Office (CBO), for example, have shown that auctioning carbon emission permits and returning the revenue to households in the form of equal lump sum payments is the best way to protect households from any higher prices that will result from limiting carbon emissions. What is your view of this approach to mitigating the impact on families, and how can we ensure that the most vulnerable American households are kept whole?

Answer. This approach would mitigate the cost of carbon permits but would not address the cost of non-economical investments in renewables. Of course households in states with great existing renewable resources would get a windfall paid for by households from other states that are not as positively situated. In most cases those households that would receive the windfall already have some of the lowest electric rates in the nation.

Question 3. I appreciate how Chairman Bingaman has worked really hard to mitigate the regional impacts in this CES proposal. But some regional disparities are inevitable, as some regions have been early adopters of clean energy and would start with more.

Answer. I'm wondering if we need a funding source to provide some transition assistance to those regions and groups that will be impacted the most. Do you think some transition assistance is necessary to prevent an economic shock to certain regions of the country and certain income groups?

Yes, funding to those geographic areas and utilities that are not situated in sun, wind and hydropower rich environments would help relieve disparities. Resources to advance nuclear construction would also be beneficial since it is impractical with current technology to supply all power from renewable sources in those regions, like Northeast Florida.

Question 4. I was concerned to learn that in some cases the cost burden for utilities regulated under the CES might result in prices almost double those for the exempted utilities. Would regulating carbon upstream reduce some of these problems and provide a more equitable cost share? And would regional disparities be minimized with a more economy wide approach to reducing carbon in our economy?

Answer. Regulating carbon upstream, at the mine and at the wellhead, would make the cost of regulation more applicable economy wide. However, the costs to mine or produce those fuels would still be passed along more directly to end users in the regions that are more heavily reliant on electricity produced from fossil fuels.

Question 5. I believe that putting a price on carbon, such as that contained in the clean energy standard, is necessary. It will unleash American ingenuity to diversify our energy mix and reduce our carbon intensity. But a price on carbon is not sufficient. We must also make critical investments—in research and development and in the grid itself. Integrating renewables into the grid demands new investments in the grid.

Answer. Washington state passed a renewable portfolio standard five years ago. Since then, renewable energy has taken off faster than anyone could have imagined. Wind, for example, now accounts for roughly 3,000 megawatts of my state's power capacity. Integrating this much wind into the grid so fast has produced challenges. In my home state, we have so much wind power that at certain times it has to be shut off. Two weeks ago, many wind farms were forced to shut down simply because we had too much cheap power. Too much cheap power that is both clean and sustainable should be a boon for our economy—not a burden to bear.

A study by the Electric Power Research Institute estimated that the net investment necessary to create a power delivery system of the future would be between \$17 and \$24 billion dollars per year over the next 20 years. That same study found that every dollar of investment in the grid would return four dollars of benefits such as reduced outages, increased efficiency, and lower demand for energy at peak times.

Washington state has been leading on realizing this smart grid of the future that we so urgently need. The Pacific Northwest National Laboratory, PNNL, led a study to determine how willing homeowners are to use smart grid technologies; what benefits they found in being able to control their energy use according to pricing; and how much money they could save. Unfortunately, we're not making these critical investments.

The Department of Energy's 2011 Quadrennial Technology Review confirmed this, stating simply that we are "underinvesting in activities supporting modernization of the grid." This underinvestment delays the nation's transition to a more resilient, reliable, and secure electricity system that integrates renewables into the system. Do you believe that grid modernization efforts and making the grid smarter are important parts of bringing more clean energy online? If so, how can we continue to make progress on modernizing our grid?

Improvements to the grid are beneficial but will still not deliver actual power generated from renewable sources in Western or Midwestern states to the Southeast. We believe that each region and each utility will invest in appropriate transmission upgrades to be able to send, move or receive needed power. In Washington and Florida utilities are investing in modernizing the grid. Regional transmission organization (RTO) regions seem to have more problems with the needed investments.

RESPONSES OF JAMES A. DICKENSON TO QUESTIONS FROM SENATOR BARRASSO

Question 1. In your written testimony, you state that your "customers express concern about the absolute cost of energy." You also say that under this legislation the total cost to your customers over the next 20 years would be an additional \$14 billion, an increase of 64 percent over your base costs. Do you believe your customers-

American families and businesses—can afford the higher electricity costs that this bill would bring?

Answer. No, our customers are already concerned about the cost of electricity. Electric rates currently have the most negative impact on JEA's favorability with customers, with favorability being one measure in a third-party customer satisfaction industry survey. During JEA's fiscal year 2011, 70 percent of customers surveyed said that they were concerned about paying their bills, up from 60 percent the previous year. The national average at that time was 51 percent concerned. Social service agencies that provide customer bill assistance, including LIHEAP, indicate they always have more requests for assistance than available dollars. There will be other requirements or constraints and economic factors that may combine to impact customer rates over the same time period, including additional financial and environmental regulation.

Question 2. In your written testimony, you explain that the Jacksonville Electric Authority (JEA) has "made significant capital investments to modernize environmental controls at its existing coal plants." You also state that "mov[ing] away from existing coal generation . . . will strand . . . [these] large capital investments." Would you please elaborate on how S. 2146 would strand JEA's large capital investments?

Answer. Although JEA has some of the cleanest coal plants in the nation, JEA would retire existing coal plants earlier than it otherwise would have to meet the CES (as shown on Exhibit A of the May 17 written testimony). Some of those plants would still have outstanding debt. Since the CES is aggressively phased in by time (20 years) and by target percentages (80 percent), reaching sufficient clean sources will require replacement of coal sources earlier than intended. With most technologies, plant life cycles are 30 to 40 years and those can be increased by significant timeframes with ongoing maintenance and plant upgrades, including pollution controls. There would not be incentive to continue those upgrades, enhancements and renewals knowing that the CES in effect sunsets current technology coal generation. Additionally, with EPA's move toward greenhouse gas regulation for new sources, we anticipate a similar move to regulate existing sources in the future. That will act as another disincentive to upgrade existing coal generation capacity.

Question 3. In your written testimony, you explain that "the Southeast, unlike the West, Pacific Northwest and Midwest, [is] not blessed with substantial wind resources, hydropower options, or intense sun and expansive open lands for solar installations." You state that "any national clean energy standard will create substantial competitive impacts between regions, favoring those [with] geographic assets that more readily support development of solar, wind and hydropower." Finally, you say that the costs to meet the requirements of S. 2146 "are higher for . . . Southeast utilities . . ." Would you please elaborate on the competitive disadvantage that the Southeast would have under any national clean energy standard?

Answer. Nuclear and biomass are the "clean" generation sources that make sense geographically in much of the Southeast at present, especially in Jacksonville. Based on current technology, there are not good wind options for Northeast Florida. Solar does not provide sufficient amounts of round-the-clock energy to meet our customer demand even if it were cost effective as compared to other sources. The treatment of biomass from a greenhouse gas standpoint is still undetermined, which further limits the options. Natural gas will only receive partial credit under the CES and JEA strives to avoid reliance on a single fuel source based on past experience. Therefore, replacement of existing fossil fuel generation, like coal and petcoke, and the anticipated volatility of natural gas supply and pricing from national reliance on one source will drive the need to invest in new high-capital nuclear generation.

RESPONSES OF KEITH B. TRENT TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. What mechanisms would be in place under S. 2146 to protect consumers against significant electricity rate increases? Last Congress, in S. 1462, this Committee reported out a 15 percent Renewable Electricity Standard that authorized the DOE Secretary to waive the requirements if the incremental cost of annual compliance exceeded 4 percent per retail customer. Would Duke Energy ("Duke") support this kind of additional consumer rate protection?

Answer. S. 2146 includes an Alternative Compliance Payment which is intended to moderate cost impacts—however, rate impacts will vary depending on the amount of natural gas fueled generating capacity, wind and nuclear generating capacity already in place in each state. Duke Energy would be supportive of rate protection, such as the rate increase limit that was included in S. 1462, if necessary to protect

consumers from excessive rate increases and if constructed so that our compliance obligation was similarly limited.

Question 2. One issue that seems to be lost in the CES discussion is the needed transmission to get these new clean energy resources to load. In Duke's experience, how difficult is it to pay for and build new transmission? Also in last Congress's Renewable Electricity Standard contained in S. 1462, we carried a provision that would allow the Secretary to request a variance from the mandate's requirements on the basis of transmission constraints preventing delivery of service. Is a transmission variance something Duke would support?

Answer. This is an excellent point. New transmission projects can take ten years or more to complete due to the time required to secure regulatory approvals, site the line and construct it and the supporting facilities. And the issue of paying for multi-state lines can be very contentious.

Duke Energy would consider supporting a variance to deal with transmission constraints if necessary and so long as it would not provide competitive advantages or uneven implementation of the overall program. We would note that the legislation requires that utilities turn in clean energy certificates that they can either create through generation of clean energy, or purchase on the market. It does not require actual delivery of the clean energy to the utility or utility customers.

Question 3. In a recent National Journal story, Michael Brune, Executive Director of the Sierra Club, vowed to "prevent new gas plants from being built wherever we can." His stated goal is to "make sure we're not simultaneously switching to natural-gas infrastructure" as coal plants retire. In your testimony, you note Duke's opposition to the inclusion of natural gas into a CES mandate. Given your opposition to natural gas as a qualifying resource in the CES, do you agree with the Sierra Club's statement?

Answer. No. Duke Energy firmly believes that natural gas is an important energy resource and that it can be developed and used safely and responsibly. Duke Energy's concern with the inclusion of natural gas as a qualifying resource in the clean energy standard is that natural gas is already deploying very strongly because of currently low prices for natural gas. Inclusion of natural gas in the program weakens the incentives for other vital energy technologies, especially nuclear and carbon capture and sequestration.

Question 4. You testified that Duke "find[s] the incentive too weak to advance carbon capture technologies, which most energy experts, including engineers and economists at the Electric Power Research Institute, MIT and other institutions agree is a vital technology." In Duke's opinion, why does S. 2146 fail to incentivize CCS technologies?

Answer. Based on our review of the various analyses of S. 2146 it appears that the price of Clean Energy Certificates will be too low to incentivize carbon capture and sequestration. Outside of changing the supply/demand structure of this new market the Committee might consider other incentives within the program or complimentary incentives outside the program such as tax incentives to make CCS more attractive.

Question 5. Duke already operates in states that have their own renewable or clean energy mandates. How do you anticipate a federal CES program working with existing state programs that have vastly different qualifying resources, targets and timetables? Do you believe the federal program will become a de facto floor? Do you believe that state programs that are not as stringent as a federal CES will need to be preempted?

Answer. We can imagine a program design that allows both programs to coexist. Each qualifying resource should be allowed to generate two certificates—a State certificate and a Federal certificate (a Megawatt hour from a wind turbine would create a one MWh certificate for the state and another for the federal program). Of course, our preference would be to have only a single standard to manage as we do not believe that separate state and federal programs create value for consumers.

Question 6. Does Duke believe a federal electricity mandate is necessary if there are incentives like a Production Tax Credit (PTC) in place? Conversely, does it make sense to have PTC treatment if there's a federal electricity mandate?

Answer. If Congress were to pass significant tax incentives for CCS and nuclear and maintain the existing PTC/ITC for renewables, the need for a program like a Clean Energy Standard would be considerably reduced. Conversely, if Congress adopts a workable Clean Energy Standard, Duke could support the phase out of the existing PTC/ITC for renewables.

RESPONSES OF KEITH B. TRENT TO QUESTIONS FROM SENATOR CANTWELL

Question 1. I believe one of the most important parts of any energy or climate policy is protecting consumers from any energy cost increases that result from the policy. This is especially important for the lower and middle classes that spend a higher fraction of their income on energy. While I'm not convinced that some of the cost estimates accurately represent how prices of new technologies actually behave, I'm curious what, in your opinion, is the best way (other than energy conservation and efficiency) to protect the incomes of lower and middle income families as we transition to a clean energy economy?

Answer. As the existing electricity system continues to age, we face an ongoing need to retire and replace power plants. This will result in rate increases, which will admittedly vary by state depending on the age of the fleet serving the state and the replacement technologies available. The economic impact of rate increases is partly determined by the size of these increases—a series of small increases over time is easier to digest than a large increase in a short time which can have a more severe impact on businesses which employ people. If increases can be kept small and spread out over time, then businesses and households can adjust. Also energy efficiency programs targeting both the residential and industrial consumers can negate a portion of the rate increase.

Question 2. Studies by the Congressional Budget Office (CBO), for example, have shown that auctioning carbon emission permits and returning the revenue to households in the form of equal lump sum payments is the best way to protect households from any higher prices that will result from limiting carbon emissions. What is your view of this approach to mitigating the impact on families, and how can we ensure that the most vulnerable American households are kept whole?

Answer. While a revenue neutral tax which returns the income to households may be appealing, we are concerned about the impact on larger industrial energy consumers. The revenue neutral tax which returns the revenue to households only would mean that these industries would see notably large rate increases in the first year of the program—we estimated that a twenty dollar carbon price in a coal state like Indiana, (home to a lot of heavy manufacturing), would cause about a 40 percent electricity price increase. If the program really returned most of that sum back to consumers through some sort of rebate, they may be irritated but economically undamaged. However, returning revenues to households would not help businesses as it may be politically difficult to include these businesses in a revenue sharing plan). If these businesses are hit all at once by a large increase, it would likely have an adverse impact on these companies' viability—an unacceptable outcome.

A revenue neutral tax, should it be pursued, should also factor in the impact of shifting revenues from carbon intensive states to low carbon states. Coal dependent states would see the largest price increases and pay the most into the program. If possible, revenues should be returned to people in the state and not transferred to households in lower carbon states that tend to already enjoy a substantially higher standard of living.

Question 3. I appreciate how Chairman Bingaman has worked really hard to mitigate the regional impacts in this CES proposal. But some regional disparities are inevitable, as some regions have been early adopters of clean energy and would start with more.

I'm wondering if we need a funding source to provide some transition assistance to those regions and groups that will be impacted the most. Do you think some transition assistance is necessary to prevent an economic shock to certain regions of the country and certain income groups?

Answer. Duke Energy shares your concern with the disparate regional impacts. We would strongly support both ensuring that the structure, targets and timetables of the Clean Energy Standard are as workable for all regions as possible. In addition, we would support the Committee considering the addition of transition assistance for regions that are disproportionately impacted by the policy.

Question 4. I was concerned to learn that in some cases the cost burden for utilities regulated under the CES might result in prices almost double those for the exempted utilities. Would regulating carbon upstream reduce some of these problems and provide a more equitable cost share? And would regional disparities be minimized with a more economy wide approach to reducing carbon in our economy?

Answer. Duke Energy shares your concern about the unfairness of exempting small utilities, which we think resulted from a misunderstanding of the compliance options available under a tradable program—no utility would be required to build these resources, but rather all electric consumers would help to pay for these technologies, the development of which should be seen as vital to the future of a reliable, affordable and clean electric system. If all electricity consumers are required to pro-

cure clean energy certificates, thereby helping to pay for the continued development of clean energy technologies, the burden of this shared responsibility will be less for everyone.

Regulating carbon upstream would not address the disparity if the smaller utilities remained exempt from the program. If carbon were regulated upstream, then it would be harder to define this as a clean energy program rather than an emissions program.

Presuming all utilities were required to participate in an upstream program, where the cost of the carbon were placed on the fuels, then there would still be significant regional costs disparities, depending on the carbon intensity of the existing electricity generation fleet. This might be made more manageable through an allowance or credit allocation program, or if via a fee or carbon tax, through managing the price path so as to produce very small year on year changes.

Question 5. I believe that putting a price on carbon, such as that contained in the clean energy standard, is necessary. It will unleash American ingenuity to diversify our energy mix and reduce our carbon intensity. But a price on carbon is not sufficient. We must also make critical investments—in research and development and in the grid itself. Integrating renewables into the grid demands new investments in the grid.

Washington state passed a renewable portfolio standard five years ago. Since then, renewable energy has taken off faster than anyone could have imagined. Wind, for example, now accounts for roughly 3,000 megawatts of my state's power capacity. Integrating this much wind into the grid so fast has produced challenges. In my home state, we have so much wind power that at certain times it has to be shut off. Two weeks ago, many wind farms were forced to shut down simply because we had too much cheap power. Too much cheap power that is both clean and sustainable should be a boon for our economy—not a burden to bear.

A study by the Electric Power Research Institute estimated that the net investment necessary to create a power delivery system of the future would be between \$17 and \$24 billion dollars per year over the next 20 years. That same study found that every dollar of investment in the grid would return four dollars of benefits such as reduced outages, increased efficiency, and lower demand for energy at peak times.

Washington State has been leading on realizing this smart grid of the future that we so urgently need. The Pacific Northwest National Laboratory, PNNL, led a study to determine how willing homeowners are to use smart grid technologies; what benefits they found in being able to control their energy use according to pricing; and how much money they could save. Unfortunately, we're not making these critical investments.

The Department of Energy's 2011 Quadrennial Technology Review confirmed this, stating simply that we are "underinvesting in activities supporting modernization of the grid." This underinvestment delays the nation's transition to a more resilient, reliable, and secure electricity system that integrates renewables into the system. Do you believe that grid modernization efforts and making the grid smarter are important parts of bringing more clean energy online? If so, how can we continue to make progress on modernizing our grid?

Answer. Duke Energy strongly believes that smart grid technology is a key component of modernizing the nation's power system as it will enable many advanced energy efficiency technologies and help with challenges like integrating renewable resources into the grid. Another major benefit of the smart grid is, as you noted, it can shorten or prevent power outages by making the grid "self-healing" by automatically switching relays to limit or prevent blackouts. For all these reasons, investment in modernizing the grid is money well invested.

Congress can help create the conditions where deployment is more likely to be efficient and effective by encouraging the development of industry-wide standards, similar to those which apply to mundane items like electrical plugs or light switches as easy examples. This would help cut through the market clutter and uncertainty as each vendor pursues tracks which do not allow the easy integration of their product into the total system. In addition, there is a tremendous need to educate consumers about the advantages of this new technology. In some regions of the country, the roll out of smart meters and other components of the smart grid have been slowed by opposition from a minority of customers. With a smart grid enabling advanced energy efficiency and management technologies, we would be able to tap into new sources of zero emission energy while buffering the impacts of higher energy bills.

RESPONSE OF KEITH B. TRENT TO QUESTIONS FROM SENATOR MANCHIN

Question 1. Mr. Trent, in your testimony, you said, “A Clean Energy Standard could help unlock billions of investment dollars that are poised to transform coal to a fuel that can be used far more efficiently and cleanly in the decades to come. Domestic and foreign investors are ready to make big investments in emerging technologies like carbon capture and sequestration. They just need an appropriate incentive to lower the technology’s investment risks. A well designed Clean Energy Standard can provide that incentive.” EIA projects that under S. 2146, virtually no electricity will be generated from coal with CCS. What changes do you think will need to be made to the Clean Energy Standard that would encourage utilities like Duke to install carbon capture and sequestration?

Answer. Based on our review of the various analyses of S. 2146 it appears that the price of Clean Energy Certificates will be too low to incentivize carbon capture and sequestration. Other “clean” technologies will be cheaper and will represent the least cost compliance approach. Outside of changing the supply/demand structure of this new market the Committee might consider other complimentary incentives outside the program such as tax incentives to make CCS more attractive.

RESPONSE OF KAREN PALMER TO QUESTION FROM SENATOR BINGAMAN

Question 1. A design goal for the CES is to minimize any regional inequity that could result from the program. Do you have any suggestions for improvements to the design of the proposed CES that would help in this regard?

Answer. Our research suggests that price impacts of the CES policy will be bigger in regions that have more coal-fired generation. The ACP will mitigate this somewhat by limiting the cost impacts of the program. Another approach that could help to mitigate regional price effects would be to credit generation from existing nuclear and hydro facilities at 0.1 credit instead of excluding them from the requirements of the program as the bill currently does. Another way to look at the program is that it is undoing existing regional inequities in the cost of electricity due to the failure to account for the environmental costs of electricity production using high emitting technologies. As my co-authors and I point out in our RFF discussion paper that evaluates this CES policy (see <http://www.rff.org/RFF/Documents/RFF-DP-12-20.pdf>), the policy tends to reduce the differences in prices across regions of the country.

RESPONSES OF KAREN PALMER TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. Do you believe a federal mandate should not contain any cost-containment measures such as an Alternative Compliance Payment? Last Congress, in S. 1462, this Committee reported out a 15 percent Renewable Electricity Standard that authorized the DOE Secretary to waive the requirements if the incremental cost of annual compliance exceeded 4 percent per retail customer. Would Resources for the Future (RFF) support this kind of additional consumer rate protection?

Answer. I think that an ACP, which essentially serves as a cap on the price of clean energy credits, is a good idea for a CES policy. Such a cap should be set at a level (in dollars per MWh) where it is not expected to be binding. Because the CES policy allows for banking, the ACP should increase at the rate of interest over time. I hasten to add that my opinion here (and in my testimony) is my opinion alone and should not be attributed to Resources for the Future (RFF). RFF does not take positions on policy issues.

Question 2. Why are some existing renewable resources not eligible for Credits? For example, why are some generation resources excluded from the bill based solely on the date they were built? Why does it matter when they were built as long as they meet the carbon intensity criteria?

Answer. I believe that the logic behind giving credits to newer vintage renewables is to avoid transfers to owners of existing facilities that would operate with or without the credits. The point of the policy is to encourage investment in new low-emitting or non-emitting sources of electricity. Renewable facilities typically have very low operating costs and older facilities will likely operate with or without the credit. Giving credit to facilities that will operate anyway as a result of the policy tends to increase the costs to consumers while not increasing the environmental and technology deployment benefits of the policy. One way to reduce the size of these transfer payments and provide an incentive for renewables that might not generate or might generate less in the future to keep generating is to give a partial credit to existing facilities (such as 0.1 of a credit for existing hydro and nuclear facilities), as described in the answer to the question from Senator Bingaman.

Question 3. Do you believe a federal electricity mandate is necessary if there are incentives like a Production Tax Credit (PTC) in place? Conversely, does it make sense to have PTC treatment if there's a federal electricity mandate?

Answer. The CES and the PTC have different purposes and very different goals. The PTC is targeted at renewables exclusively and is intended to encourage the development and use of these relatively new technologies, such as wind power, in order to help increase their use and lower their cost. The CES is a much more ambitious policy that attempts to encourage investment in and greater electricity generation from both low- and non- CO₂ emitting technologies. The PTC is not a substitute for the CES. Whether a PTC is still necessary when there is a CES in place is an open question. One reason it might be warranted is that in the early years, the CES tends to encourage more gas than renewables and if there is a learning curve effect of greater renewable use, the CES alone may not provide a sufficient push to the higher cost renewable technologies to realize those learning benefits and thus anticipated reductions in the costs of renewables associated with greater deployment would be slower to be realized under the CES alone than under a CES combined with a PTC.

Question 4. You testified that the small utility exemption creates a difference in electricity prices between exempt and non-exempt utilities under the policy that grows to close to 50 percent on average by 2035. Does RFF believe that no exemption is appropriate and that all utilities should be subject to the CES mandate? What about utilities in Alaska and Hawaii?

Answer. I believe that all utilities should be subject to the CES mandate, much the way that all utility generators (except the very smallest) are subject to the requirements of the Clean Air Act for emissions of SO₂ and other air pollutants. Again, this is my opinion and should not be attributed to RFF.

Question 5. Why is there no growth in CCS technologies under a federal CES program?

Answer. According to the assumptions about technology costs in our modeling (which are largely consistent with assumptions used by EIA in its AEO 2011), new IGCC capacity with CCS is not economic with the CES policy as specified. The ACP is a contributing factor here. When we run the CES without an ACP we get 50 TWh of generation from IGCC with CCS by 2035. We also do not allow for CCS retrofit of existing fossil fuel generators in our modeling so we are not able to comment on the economics of that particular option.

RESPONSES OF KAREN PALMER TO QUESTIONS FROM SENATOR CANTWELL

Question 1. I believe one of the most important parts of any energy or climate policy is protecting consumers from any energy cost increases that result from the policy. This is especially important for the lower and middle classes that spend a higher fraction of their income on energy. While I'm not convinced that some of the cost estimates accurately represent how prices of new technologies actually behave, I'm curious what, in your opinion, is the best way (other than energy conservation and efficiency) to protect the incomes of lower and middle income families as we transition to a clean energy economy?

Answer. From an electricity consumer perspective, one of the attractive features of the CES policy relative to a carbon pricing scenario that is designed to achieve the same level of emissions reduction, is that the electricity price impacts of the CES as specified in the bill are typically lower and happen later in time than the price impacts of the carbon fee. This can be seen by comparing the CES and the Carbon Tax lines in the figure* below. Including an ACP in the CES policy will also help to mitigate the price impacts on consumers and our analysis finds that this effect can be quite large, particularly in regions where electricity is priced in competitive markets, where our research suggests that the ACP cuts the impact of the policy on electricity price in half in 2035.

Question 2. Studies by the Congressional Budget Office (CBO), for example, have shown that auctioning carbon emission permits and returning the revenue to households in the form of equal lump sum payments is the best way to protect households from any higher prices that will result from limiting carbon emissions. What is your view of this approach to mitigating the impact on families, and how can we ensure that the most vulnerable American households are kept whole?

Answer. This approach to mitigating the undesirable impacts of a cap and trade climate policy on low-income households has much to recommend it. Josh Blonz, Dallas Burtraw and Margaret Walls, colleagues of mine at Resources for the Future, have an article in the B.E. Journal of Economics and Policy that reaches a similar

*Figure 1 has been retained in committee files.

conclusion. They analyze the use of auction revenues under a carbon cap and trade policy that is patterned after the provisions of Waxman Markey and find that allocating allowance revenue lump sum to households dramatically reduces the regressive nature of the climate policy. One cautionary note is that the redistribution of allowance auction revenues should be done separately from household utility bills in order not to mute the incentives to conserve electricity that come from higher electricity bills. The goal is to protect the low income consumers from the consequences of the policy for their income but not to mute the effects on prices or bills which can yield desired changes in energy consumption behavior that will help to reduce CO₂ emissions. (For more information see Blonz, Josh, Dallas Burtraw and Margaret Walls, Climate Policy's Uncertain Outcomes for Households: The Role of Complex Allocation Schemes in Cap-and-Trade, B.E. Journal of Economic Analysis and Policy 10(2): article 5.)

Question 3. I appreciate how Chairman Bingaman has worked really hard to mitigate the regional impacts in this CES proposal. But some regional disparities are inevitable, as some regions have been early adopters of clean energy and would start with more.

I'm wondering if we need a funding source to provide some transition assistance to those regions and groups that will be impacted the most. Do you think some transition assistance is necessary to prevent an economic shock to certain regions of the country and certain income groups?

Answer. The main source of transition assistance under the CES policy as specified in the bill is the passage of time and the fact that the standard and the ACP rise over time. Thus in the early years the effects of the policy are small and regions will have time to adjust to the expected electricity price increases in the future.

Question 4. I was concerned to learn that in some cases the cost burden for utilities regulated under the CES might result in prices almost double those for the exempted utilities. Would regulating carbon upstream reduce some of these problems and provide a more equitable cost share? And would regional disparities be minimized with a more economy wide approach to reducing carbon in our economy?

Answer. Regulating carbon upstream at the source of the coal or other fossil fuel would solve the exempt utilities problem, because the cost of the carbon regulation would be reflected in the price of fuel to all utilities, both large and small, and presumably no utilities would be exempt. It would also make the climate policy more cost effective as it would address emissions within the electricity sector and beyond. The regional effects on households would depend importantly on the mix of fuels used to generate electricity, the aggregate stringency of the policy and how that evolves over time, and the use of emissions revenues (assuming the upstream regulation took the form of a cap-and-trade with an auction or an emissions fee). Any policy that creates revenues would also create a potential source of funds to help mitigate adverse effects on particular groups of energy consumers.

Question 5. I believe that putting a price on carbon, such as that contained in the clean energy standard, is necessary. It will unleash American ingenuity to diversify our energy mix and reduce our carbon intensity. But a price on carbon is not sufficient. We must also make critical investments—in research and development and in the grid itself. Integrating renewables into the grid demands new investments in the grid.

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Washington State has been leading on realizing this smart grid of the future that we so urgently need. The Pacific Northwest National Laboratory, PNNL, led a study to determine how willing homeowners are to use smart grid technologies; what benefits they found in being able to control their energy use according to pricing; and how much money they could save. Unfortunately, we're not making these critical investments.

The Department of Energy's 2011 Quadrennial Technology Review confirmed this, stating simply that we are "underinvesting in activities supporting modernization of the grid." This underinvestment delays the nation's transition to a more resilient, reliable, and secure electricity system that integrates renewables into the system. Do you believe that grid modernization efforts and making the grid smarter are important parts of bringing more clean energy online? If so, how can we continue to make progress on modernizing our grid?

Answer. Unlike fossil fuels, which can be transported from the point of extraction or processing to a generator, renewable resources such as solar and wind must be used where they are found. The regions with abundance of renewables are often not the regions where there is an abundance of electricity demand. Thus transmission capacity is particularly important for bringing new supplies of renewable electricity to market. With greater transmission capacity there will be more opportunities to sell excess wind generation in regions and times when supply exceeds demand in a particular location and curtailments will presumably be avoided. More transmission capacity will also enable the grid operators to take advantage of differences in availability of wind and solar energy across space at particular points in time. The types of investments that are needed to facilitate getting renewable electricity from the point of supply to where the customers are is not necessarily modernization of the smartness of the grid but more increases in capacity in key locations. These types of investments need to be evaluated further to see how they compare in cost and cost effectiveness in dealing with intermittency of renewable supply and matching supply and demand.

The role of the smart grid (as opposed to just the grid) in enabling the transition to more use of renewables is not something that I have studied specifically. However, it could be particularly important for greater integration of distributed renewables (PV on roof tops and distributed wind) and for encouraging reductions in demand at key periods as well as for integration of plug-in electric vehicles, which could provide a means for storing excess electricity that is generated from wind turbines at night.

RESPONSES OF THOMAS J. GIBSON TO QUESTIONS FROM SENATOR BINGAMAN

In your testimony, you've raised concerns about the potential for energy intensive manufacturing like the Iron and Steel Industry to become uncompetitive in the global market if electricity rates rise. Your testimony also expresses support for Congress to craft a "comprehensive and market-driven energy policy" that would develop natural gas, nuclear power, and clean coal resources, and fully make all these sources of energy part of the nation's energy independence strategy moving forward. In many ways this, to me, describes the CES that I have proposed here.

Question 1a. Are there ways within the CES paradigm to reduce any adverse impacts for energy intensive manufacturing?

Answer. Although AISI is opposed to the creation of a federal CES, there are several concepts that, if included in the program, could mitigate some of the negative impact on energy intensive manufacturing sectors such as steel. First, there is potential for steel production facilities to qualify as energy efficiency producers in a CES, either through combined heat and power (CHP) capacity or through the capture and conversion to energy of otherwise wasted process heat and byproduct gases created during steelmaking. Although technology for capturing and converting wasted heat and process gases to energy is commercially available, it is also capital intensive. Adding wasted heat and gas recovery as a qualified source of renewable or "clean" electricity generation would make the technology more cost effective, and help to achieve the CES legislation's goals.

Second, steel facilities often have the ability to participate in demand response mechanisms with utilities, such as programs where manufacturing plants agree to reduce electricity consumption during periods of peak electricity demand. Some steel producing facilities operations take electric service from utilities under some form of interruptible or non-firm rate service that can be curtailed during system peaks when electricity generation costs are high and system reliability is threatened. This arrangement benefits utilities and other consumers as local utilities avoid having to construct additional generation capacity to serve the non-firm load. By reducing load in response to the utility request, steel producers lower costs for all other system users, improve overall system reliability, and reduce peak generation-related emissions. In providing this benefit, steel facilities incur lost production and production inefficiencies that increase their operating costs.

Several states have policies in place that recognize demand response measures, including interruptible or non-firm rate measures, as providing an energy efficiency

benefit under their state renewable electricity standards (RES). Accordingly, these states prohibit the renewable surcharge attributable to the RES from being applied to the portion of an electricity bill that is interruptible or non-firm rate service. These policies incentivize efficiency from both utilities and manufacturing customers and are often implemented to mitigate the costs utilities—and their industrial customers—face from state RES mandates. This concept could also be recognized in the federal CES.

Finally, changes to the proposed CES to limit the cost impact of the mandate on energy consumers would lessen the impact on manufacturing facilities served by utilities that rely heavily upon coal. For example, the federal RES proposal contained in the American Clean Energy Leadership Act (ACELA) from the 111th Congress included a provision to permit a utility to apply to the Secretary of Energy for a waiver to limit the incremental cost of RES compliance to not more than 4 percent per retail customer. A similar provision would potentially reduce impacts of a CES on energy intensive manufacturers if drafted appropriately.

Question 1b. Do you have concrete suggestions for how to accomplish the goals that you've set out above (nuclear, CCS, even more natural gas) that will not have the same potentially adverse effects on your industry?

Answer. AISI believes that Congress should craft a comprehensive and market-driven energy policy built around promoting greater development of all domestic energy sources, incentives for efficiency improvements, and additional support for industry efforts to develop breakthrough technologies. These policy measures will serve to meet shared national clean energy goals, while avoiding the negative impact a CES would have on the industrial sector. In particular, such a policy agenda should:

- Create an abundant and affordable energy supply—by developing domestic oil, natural gas, nuclear power, and clean coal resources, along with competitive renewables, and fully make all these sources of energy part of the nation's energy independence strategy moving forward. The federal government should not implement policies that restrict domestic resources from being fully harnessed, especially natural gas production from shale. Additionally, regulatory certainty for energy producers, regardless of the types of energy they produce, is essential. Grafting additional requirements onto the existing Federal regulatory structure will exacerbate the uncertainty that already exists. For instance, AISI supports Senate passage of H.R. 1229, H.R. 1230 and H.R. 1231, three bills aimed at expanding oil and natural gas production in the Outer Continental Shelf (OCS) that passed the House in 2011. Also, the Department of Interior's proposed Five-Year Plan for 2012-2017 ignores the resource potential of several key OCS areas, depriving the nation of the energy, economic, and revenue benefits that they hold. It should be expanded to include these additional areas.
- Maximize the energy efficiency of existing industrial facilities in the near-term—This can be achieved in part by recognizing the efficiency opportunities within the domestic steel industry. Financial incentives could be provided to steel producers to facilitate the capture and conversion to electricity of wasted heat and byproduct gases at industrial facilities. Also, steel facilities that participate in demand response mechanisms with utilities that reduce electricity usage during periods of peak demand, should receive credit for their contribution to improved energy efficiency.
- Support breakthrough research for longer-term benefits—To further lower energy intensity and to substantially reduce emissions, new processes must be developed that do not rely on carbon fuels. Partnership with the Department of Energy, and support of Congress, is essential to achieving these goals. Many developed and developing nations with which our industry competes fund manufacturing research for carbon reduction and energy efficiency at higher levels than the U.S. For steel manufacturing alone, the Japanese government has funded 100 percent of a \$120 million effort to develop new steelmaking breakthrough technology. Likewise, in Europe, the first \$100 million phase of Europe's ULCOS (Ultra-Low Carbon dioxide (CO₂) Steelmaking) project has received 40 percent government funding. South Korea's government has contributed 50 percent of the \$27 million dedicated for breakthrough technology research for the steel industry there.

For our part, AISI and its members continue to invest in the CO₂ Breakthrough Program, a suite of research projects designed to develop new ironmaking technologies that emit little or no CO₂ while conserving energy. We have developed two key technologies to achieve those goals, and they are now ready for pilot scale testing. The research is being done at MIT and University of Utah and both projects were the subject of proposals recently submitted to the Department of Energy. We

are pleased that just last week the University of Utah project was selected by the Department of Energy's Innovative Manufacturing Initiative for a \$7.1 million award. This successful partnership with DOE, along with the continued support of Congress, will accelerate the development and deployment of critical breakthrough technologies. Also, legislation that facilitates such research with a particular focus on domestic manufacturing, like Senator Sherrod Brown's Investments for Manufacturing Progress and Clean Technology (IMPACT) Act of 2009, can help maintain our competitive position in the world.

RESPONSES OF THOMAS J. GIBSON TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. The domestic steel industry is obviously energy-intensive and subject to substantial international competition, particularly from China. The EIA has determined that a CES will raise end-use costs by 25 percent by 2035 for industrial consumers such as AISA. How much electricity do members of the Iron and Steel Institute purchase on an annual basis? What does an increase in electricity costs really mean for an internationally-competitive industry such as yours? How long-term do you need to assess pricing impacts?

Answer. In 2010, the latest year for which cumulative data is available, our domestic steel industry consumed 45.7 billion kWh of electricity. An increase of 1 cent per kWh in the average electricity costs paid by steel producers has a total economic impact of \$450 million in increased costs to the industry as a whole. Steel is extensively traded internationally; in 2011, 31 percent of all steel manufactured in the world was exported to another country. The United States is the most open market in the world for steel, and as such increases in costs cannot be passed on to customers who can choose to purchase steel from foreign producers not facing such costs. Furthermore, as I noted in my written testimony, China, the world's largest producer of steel, subsidizes its industry in a number of ways, including through government-subsidized energy.

Steel plants are very expensive and long-lived capital assets. A new facility built today will be in service for decades to come, as will many existing facilities. Companies make investment decision for steel production facilities based on a number of factors, including projected long-term energy prices, as steel plants cannot simply move to an area with lower costs to remain competitive. Thus the threat of higher energy prices is a significant deterrent to new investment in the domestic steel industry.

Question 2. What kind of real-world impact on jobs would an industry such as yours experience under a federal electricity mandate?

Answer. A recent report commissioned by AISI found that every individual job in the steel industry supports seven additional jobs in other sectors of the economy. In aggregate, the steel industry accounts for over \$101 billion in economic activity and supports more than 1 million jobs across the country. As detailed in my statement, as an energy-intensive and trade-exposed industry, policies like a federal CES that would raise production costs for domestic steel producers threaten the competitiveness of steel production in the U.S., and the jobs associated with it.

Question 3. During the hearing, the question was raised how the suite of EPA regulations achieves policy goals for greenhouse gas (GHG) emissions for existing facilities. It was stated that EPA regulations are only directed at new facilities, while a CES would regulate existing facilities. You testified that S. 2146, if signed into law, would be the primary mechanism for regulating GHG emissions. If S. 2146 is signed into law as written, wouldn't existing facilities be subject to retrofits necessary to comply with the suite of EPA regulations, in addition to a CES?

Answer. Yes. As drafted, S. 2146 does not preempt EPA regulation of stationary sources for GHGs, so facilities subject to S. 2146 remain susceptible to EPA GHG regulations, which at this point only extend to new facilities but are likely to be extended to existing facilities in the future unless the Federal Courts or Congress intervene.

Earlier this year, EPA announced its New Source Performance Standards (NSPS) proposal for the regulations of GHGs from electric generating utilities (EGUs). EPA indicated at the time of the proposal that the regulations would only apply to new power generating facilities. However, based on EPA projections for future electricity generation composition and the potential for future litigation, expectations are that these regulations will eventually apply to existing EGU facilities. Beyond that, existing and new power plants are also slated to be subject to a variety of other regulations, including the Cross State Air Pollution Rule (CSAPR), the Mercury and Air Toxics Standards Rule, or "Utility MACT," coal combustion residuals, and Clean Water Act section 316(b) cooling water intake structures. All of these regulations will all have an impact on coal-fired utilities.

The result of these regulations, along with market conditions regarding natural gas, are already causing a shift from coal- to natural gas-based electricity generation. Coal was last above 50 percent of U.S. electricity generation in 2008. It is now at 45 percent, and projected to continue to decline to 39 percent by 2035 even without a CES in place.

If the CES proposed by S. 2146 were to be enacted as written, existing electricity-generating infrastructure would face multiple retrofit requirements that are presently scheduled to occur at virtually the same time to comply with the suite of Clean Air Act regulations. Some clean air technologies result in the consumption of additional energy and thus might act contrary to the purposes of a CES. As I stated at the hearing in response to questions, if a CES were to become law, preemption of EPA regulatory air requirements for the utility sector would be necessary to avoid these consequences.

Question 4. Do you believe a federal electricity mandate is necessary if there are incentives like a Production Tax Credit (PTC) in place? Conversely, does it make sense to have PTC treatment if there's a federal electricity mandate?

Answer. Currently, over 4 percent of electricity generation in the United States comes from non-hydropower renewable sources. Generation from non-hydro renewables has more than doubled since 1990. The existing PTC has undoubtedly contributed to this increasing amount of renewable power generated. A federal RES or CES would similarly be designed to increase production from wind and solar sources, but as a mandate rather than a tax incentive. If a CES and PTC were both part of federal statute, the same kWh of renewable electricity could potentially be qualified for both policies. This seems redundant and unnecessary. Instead of creating an additional mandate for production, maintaining the production incentive would be preferable policy.

Ideally, a comprehensive market-driven national energy policy would be the best approach for the United States. Such a policy should promote greater development of all domestic energy sources, as well as efficiency improvements, and breakthrough technologies, through market-based incentives, rather than through government mandates that would threaten the competitiveness of key industries like steel.

RESPONSES OF THOMAS J. GIBSON TO QUESTIONS FROM SENATOR CANTWELL

Question 1. I believe one of the most important parts of any energy or climate policy is protecting consumers from any energy cost increases that result from the policy. This is especially important for the lower and middle classes that spend a higher fraction of their income on energy. While I'm not convinced that some of the cost estimates accurately represent how prices of new technologies actually behave, I'm curious what, in your opinion, is the best way (other than energy conservation and efficiency) to protect the incomes of lower and middle income families as we transition to a clean energy economy?

Answer. AISI agrees with your concerns about energy cost increases that could result from climate or energy policy. This is especially important for an industry, such as steel production, that is both energy-intensive and trade-exposed. AISI comes at this question from a job creation perspective: if you do not have a job then energy at any price is unaffordable. Our concern is that policies that unilaterally raise the cost of making steel in the U.S. have the potential to shift that production overseas to places with lower energy costs (and perversely, higher GHG emissions per ton of steel produced), resulting in the loss of many good-paying manufacturing jobs.

Every individual job in the steel industry supports seven additional jobs in other sectors of the economy. In aggregate, the steel industry accounts for over \$101 billion in economic activity and supports more than 1 million jobs across the country. Without appropriate provisions for industries like steel that cannot simply pass increased energy costs on to its customers, these valuable manufacturing jobs and the associated incomes for industry employees would be put in jeopardy by a CES mandate.

Question 2. Studies by the Congressional Budget Office (CBO), for example, have shown that auctioning carbon emission permits and returning the revenue to households in the form of equal lump sum payments is the best way to protect households from any higher prices that will result from limiting carbon emissions. What is your view of this approach to mitigating the impact on families, and how can we ensure that the most vulnerable American households are kept whole?

Answer. AISI did not support GHG cap-and-trade proposals made in previous Congresses because of the negative economic impact to energy-intensive, trade-exposed manufacturing sectors—especially steel production—that would occur as a result enactment of such proposals. We continue to believe that such programs, with-

out the appropriate policy measures to address cost impacts, would threaten the ability of energy-intensive, trade-exposed industries like steel manufacturing to remain competitive in global markets. The struggles of European manufacturers under the EU Emissions Trading System are a case in point.

While these proposals were being debated, AISI emphasized the necessity for any legislation to provide a full allocation of allowances to energy-intensive, trade-exposed manufacturers for both direct emissions costs and to offset the expected increases in energy costs that manufacturers would face. It was also essential that legislation include an automatically triggered border adjustment measure for imports from all countries that do not have in place comparable GHG emissions regulations. We also stated at the time that effective national climate legislation must prevail over inconsistent state laws and initiatives and should supersede existing federal law and avoid overlapping regulation of greenhouse gases. Finally, we believe that a robust federal research and development effort into breakthrough technologies for key manufacturing sectors is essential.

Question 3. I appreciate how Chairman Bingaman has worked really hard to mitigate the regional impacts in this CES proposal. But some regional disparities are inevitable, as some regions have been early adopters of clean energy and would start with more.

I'm wondering if we need a funding source to provide some transition assistance to those regions and groups that will be impacted the most. Do you think some transition assistance is necessary to prevent an economic shock to certain regions of the country and certain income groups?

Answer. AISI agrees that regional disparities are inevitable when creating a federal CES. AISI believes that S. 2146 will have a disproportionate negative impact on areas of the country that generate the majority of their electricity from coal. EIA projects that S. 2146 will substantially reduce coal-fired generation. Compared with a reference case, coal generation would decline by 25 percent in 2025 and by over half—54 percent—in 2035. Thus, within two decades, the electricity generation infrastructure of the United States would radically shift from the fuel mix that has been in place since the advent of significant nuclear power generation around 1970. States like Ohio, Indiana, Pennsylvania, and West Virginia, which use coal as the predominant fuel source for power, will be more affected by a CES than other areas of the country, due to regional differences in current fuel mix and the cost to switch to other fuels for the generation of electricity.

Certain areas of the country are better suited for renewable production from wind and solar sources, while others have an abundance of coal sources. Other regions benefit from a legacy of hydro-electric production that would be difficult to replicate under the current environmental legal regime. As noted above, creating a national CES will have a disproportionate impact on coal-fired utilities, and there is a high correlation between the service areas of those utilities and the location of steel production facilities. Industrial customers, especially steel producers, will therefore face significant additional charges to offset the cost of replacing coal capacity with other sources, including the cost of new transmission infrastructure.

A preferred approach that would avoid these regional disparities is to leave the question of electricity mandates to the states. As of September 2011, 30 states and the District of Columbia had enforceable RPS or other mandated renewable capacity policies. Also, seven states had voluntary goals for renewable generation. The states are best equipped to reflect the availability and relative reliance of each fuel source in their geographic location, and can best craft renewable energy policy accordingly.

Question 4. I was concerned to learn that in some cases the cost burden for utilities regulated under the CES might result in prices almost double those for the exempted utilities. Would regulating carbon upstream reduce some of these problems and provide a more equitable cost share? And would regional disparities be minimized with a more economy wide approach to reducing carbon in our economy?

Answer. From AISI's perspective, the point of compliance is not really the issue as an upstream approach will still result in substantial cost impacts to energy-intensive, trade-exposed manufacturers. Imposing such upstream carbon regulations would likely result in both direct emissions costs for steel producers and indirect costs passed through to us from increases in energy production costs. We would still need to look at transition and mitigation programs similar to those needed under a cap and trade system for energy-intensive, trade-exposed manufacturers.

The disproportionate impact of a CES on certain areas of the country that was discussed in Question #3 is applicable to this question as well. The EIA analysis concedes that a CES would have disproportionate impact on certain areas of the country, largely those that are dependent on coal-based electricity, where a majority of steel production facilities are located. Many of the EPA regulations currently in

place or planned for the utility sector will have a similar disproportionate effect on the utilities that serve much of our industry.

An economy-wide approach that does not accommodate regional differences will have dramatic cost impacts on the two leading states in terms of iron and steel production in the U.S., Indiana and Ohio, as well as other leading steel producing states such as Alabama, Pennsylvania, Kentucky, and Michigan. All of these states are heavily dependent on coal for electricity production. EIA projects in its Annual Energy Outlook 2012 Early Release that by 2035, 39 percent of electricity generation will be from coal. In its analysis of S. 2146, it projects this percentage to drop to 18.7 percent in 2035, a result that will disproportionately impact the steel industry.

Question 5. I believe that putting a price on carbon, such as that contained in the clean energy standard, is necessary. It will unleash American ingenuity to diversify our energy mix and reduce our carbon intensity. But a price on carbon is not sufficient. We must also make critical investments—in research and development and in the grid itself. Integrating renewables into the grid demands new investments in the grid.

Washington state passed a renewable portfolio standard five years ago. Since then, renewable energy has taken off faster than anyone could have imagined. Wind, for example, now accounts for roughly 3,000 megawatts of my state's power capacity. Integrating this much wind into the grid so fast has produced challenges. In my home state, we have so much wind power that at certain times it has to be shut off. Two weeks ago, many wind farms were forced to shut down simply because we had too much cheap power. Too much cheap power that is both clean and sustainable should be a boon for our economy—not a burden to bear.

A study by the Electric Power Research Institute estimated that the net investment necessary to create a power delivery system of the future would be between \$17 and \$24 billion dollars per year over the next 20 years. That same study found that every dollar of investment in the grid would return four dollars of benefits such as reduced outages, increased efficiency, and lower demand for energy at peak times.

Washington has been leading on realizing this smart grid of the future that we so urgently need. The Pacific Northwest National Laboratory, PNNL, led a study to determine how willing homeowners are to use smart grid technologies; what benefits they found in being able to control their energy use according to pricing; and how much money they could save. Unfortunately, we're not making these critical investments.

The Department of Energy's 2011 Quadrennial Technology Review confirmed this, stating simply that we are "underinvesting in activities supporting modernization of the grid." This underinvestment delays the nation's transition to a more resilient, reliable, and secure electricity system that integrates renewables into the system. Do you believe that grid modernization efforts and making the grid smarter are important parts of bringing more clean energy online? If so, how can we continue to make progress on modernizing our grid?

Answer. As the landscape of generation, transmission, and utilization of electricity continues to evolve and expand, the costs of modernizing the nation's electric grid to reflect these changes will be significant. It is essential that policies be instituted to ensure that the grid is capable to handle increased demand and changing sources of electricity. In doing so, it is essential to realize that many of the costs involved in such efforts are passed on by utilities to their large industrial customers, and ultimately borne by these sectors, including steel producers. Policies addressing efforts to modernize the electric grid must therefore contain adequate measures to maintain the competitiveness of energy-intensive, trade-exposed industries, like steel.

RESPONSES OF THOMAS J. GIBSON TO QUESTIONS FROM SENATOR BARRASSO

In your written testimony, you state that: "[i]ndustrial customers, especially steel producers, will be charged to offset the cost of replacing coal capacity with other sources, including the cost of new transmission infrastructure."

Question 1a. Would you please expand on how S. 2146 would disproportionately impact the steel industry?

Answer. As detailed by analyses from EIA and others, a national CES would impose higher electricity costs on customers of coal-based utilities than it would on customers of utilities already fueled by nuclear or renewable sources. EIA projects that S. 2146 will substantially reduce coal-fired generation. Compared with a reference case, coal generation would decline by 25 percent in 2025 and by 54 percent in 2035. Thus, within two decades, the electricity generation infrastructure of the

United States would radically shift from the fuel mix that has been in place since the advent of significant nuclear power generation around 1970.

In areas of the country where the steel industry operates, coal is the predominant fuel source for generating electricity. The two leading states in terms of iron and steel production in the U.S. are Indiana and Ohio, while other important states for the industry are Alabama, Pennsylvania, Kentucky, and Michigan. A CES that will increase electricity costs on coal-based utilities more than other sources will therefore impact the steel industry more than industrial customers in other areas of the country, by virtue of geographic location.

Question 1b. Would you speak specifically to the impacts of this legislation on the steel industry in Ohio, Indiana, Pennsylvania, and Michigan?

Answer. In 2010, the share of coal-based electricity in Ohio was 84 percent, in Indiana it was 92 percent, in Pennsylvania it was 57 percent, and in Michigan it was 64 percent. Not only are these four states heavily reliant on coal as a source of electricity, but they also are key states for steel production. As of 2011, there were 115,645 direct steel jobs in Ohio, 74,131 in Indiana, 101,227 in Pennsylvania, and 67,143 in Michigan. In addition, every individual job in the steel industry supports seven additional jobs in other sectors of the economy. A national CES would make electricity supply more expensive and less reliable for the steel making facilities in these states, therefore threatening the international competitiveness of the domestic industry and the associated jobs in the industry and related sectors.

Question 2. In your written testimony, you explain that America's steel industry is subject to "substantial international competition." You say that "this competition comes from nations such as China, where the industry is largely state owned, controlled, and subsidized." You explain that U.S. steelmakers operate "under tight margins" and that "policies that raise energy costs on [American steelmakers] threaten our ability to remain competitive." Would you please elaborate on how S. 2146 would undermine American steelmakers' ability to compete with Chinese steelmakers?

Answer. Steel is trade intensive. In 2011, 31 percent of all steel produced in the world was exported from its country of origin. Steel produced in the United States competes with steel produced in nations such as China, where the industry is largely state-owned, controlled, and subsidized. These subsidies often come in the form of below market rates for electricity, creating an unlevel playing field. In fact, in two recent countervailing duty cases, the Department of Commerce determined that Chinese steel pipe producers were receiving below market rates for electricity.

Energy, especially electricity, typically composes 20 percent or more of the cost of making steel. In 2010 our domestic industry consumed 45.7 billion kWh of electricity. A 1 cent per kWh increase in the cost of electricity would cost the industry \$450 million in aggregate. Policies such as a CES that raise electricity rates on domestic producers, while our competitors receive subsidized electricity supplies, make the industry less competitive internationally and threaten the existence of valuable manufacturing jobs.

Question 3. Please describe what happens when a steel plant is closed because it is no longer economically viable. What happens to the workers, their families, and the community where the plant is located?

Answer. The North American steel industry is an important source for employment and tax revenues for local and regional economies. In the U.S., for every one job formed in the steel industry, seven additional jobs are created in other economic sectors, such as raw materials, transportation, computers, and related technical services. Steel's economic contributions are multiplied many times over, as every \$1 increase in sales by our sector increases total output in the U.S. economy by \$2.66. In aggregate, the steel industry accounts for over \$101 billion in economic activity and supports more than 1 million jobs across the country.

The steel industry is and will remain an important source for high paying manufacturing jobs and in stimulating employment both upstream for raw material and other suppliers and downstream for steel service companies, steel using industries, and related firms. Steel plants in North America are often the economic centers of their community—providing above-average wages and benefits. When steel production facilities are forced to close, the impact goes beyond the direct employees of the facility, to the jobs and employees in related industry, and to economic health of the communities in which they are located. Policies that hinder the international competitiveness of the domestic steel industry put the economic health of the industry and related industries and communities at risk.

APPENDIX II

Additional Material Submitted for the Record

STATEMENT OF AMERICAN FOREST & PAPER ASSOCIATION

The American Forest & Paper Association (AF&PA) appreciates the opportunity to submit this Statement for the Record on S.2146, the Clean Energy Standard Act of 2012.

AF&PA is the national trade association of the forest products industry, representing pulp, paper, packaging and wood products manufacturers, and forest landowners. Our companies make products essential for everyday life from renewable and recyclable resources that sustain the environment. The forest products industry accounts for approximately 5 percent of the total U.S. manufacturing GDP. Industry companies produce about \$190 billion in products annually and employ nearly 900,000 men and women, exceeding employment levels in the automotive, chemicals, and plastics industries. The industry meets a payroll of approximately \$50 billion annually and is among the top 10 manufacturing sector employers in 47 states.

BACKGROUND AND PRINCIPLES

The forest products industry is the nation's leading producer and user of carbon-neutral renewable biomass energy—While other emerging technologies are being developed, today's biomass energy is heavily dependent on wood fiber. This same woody biomass also is an essential raw material for value-added forest products, such as paper, packaging, wood products, wood-based chemicals, and other products. Forest products facilities account for 70 percent of the renewable biomass energy used by all manufacturing facilities in all sectors. Most of this energy is a byproduct of the manufacturing process, creating both thermal and electrical energy, and often using combined heat and power (or cogeneration) technology. The industry's biomass-based energy should qualify as a resource under any CES.

AF&PA's Better Practices, Better Planet 2020 initiative includes one of the most extensive set of quantifiable sustainability goals for any major U.S. manufacturing industry, with a commitment to transparently report progress towards achieving those goals. This initiative builds on our legacy as a leader in sustainable forest management principles.

Congress should avoid mandates and incentives that distort the market for woody biomass raw material—AF&PA supports market driven policies that recognize the industry's leading role in production of renewable energy, promote sustainability of forests, focus on adequate supply of raw material, and allow markets to direct the flow of fiber. Studies show that per ton of wood used, the forest products industry sustains nine times as many total jobs as the biomass energy sector. A CES is just one of many existing and potential policies that can have the unintended effect of diverting biomass supply to subsidized energy use, thereby undermining highly efficient renewable energy production at existing industry facilities.

Congress should avoid policies that will increase energy costs—Despite meeting almost two thirds of its energy demand through biomass-based energy, paper and wood products manufacturers also purchase significant quantities of energy, much of it electricity. We believe that a CES will result in increased electricity costs. Moreover, the CES would add another layer of costs onto utilities that are already facing dramatic cost increases due to a suite of current and future environmental requirements. Those costs have been estimated to be as high as \$120 billion and are not fully reflected in the Energy Information Administration's (EIA) reference case that supports the recent EIA analysis of S.2146. The EIA analysis indicates that while in the short term, electricity prices would remain relatively stable, they would increase by nearly 20 percent in later years.

As large ratepayers, AF&PA members will face steep electricity cost increases as utilities seek cost recovery of their environmental compliance costs. These increases will adversely affect the competitiveness of the industry and the jobs it provides.

AF&PA opposes policies, such as a CES, that will result in even greater electricity cost increases.

Of specific concern are the following

Clean Electric Energy From Existing Industry Mills is Excluded

AF&PA appreciates that the definition of “Clean Energy” in the bill is broad and encompasses a wide range of energy resources. This can help minimize the overall cost of the CES and avoid undue pressure on any one clean energy source. However, we are concerned that the definition of “Clean Energy” would exclude most, if not all electric energy generated by existing forest products industry facilities because of the placed in service dates included in the bill and the restrictions included in the definition of “qualified combined heat and power” (CHP).

Definition of Qualifying Biomass

The bill definition of “Qualified Renewable Biomass” is vague and could be interpreted to exclude the biomass used by the industry to generate electric energy. A study performed by RISI and commissioned by AF&PA found that for a given volume of wood consumption, the forest products industry sustains 5 times as many core jobs (i.e., mill 3 jobs) and 9 times as many total jobs (includes logging, paper converting jobs, and downstream wood processing jobs) as the energy sector. For this reason it is important that federal renewable energy policies do not preclude the industry’s biomass-based energy from qualifying under those policies.

“Carbon Neutrality” of Energy from Biomass Combustion

The bill calls into question whether energy derived from the combustion of biomass is “carbon neutral.”

The European Union, the United Nation Intergovernmental Panel on Climate Change, and recent federal and state legislation that promotes use of biofuel energy have recognized that, unlike fossil fuels, biomass is part of the natural carbon cycle. When biomass is burned for energy, the carbon dioxide absorbed from the atmosphere during tree growth is released. When forests are replanted, or allowed to regenerate naturally, that cycle is repeated. So long as forest carbon stocks are stable or increasing—as they are in the United States—biogenic carbon emissions are fully offset by carbon dioxide sequestration in regenerating forests and do not result in a net increase in atmospheric carbon dioxide concentrations. On the other hand, fossil fuel combustion has no such repeating cycle. Stored over millions of years, the GHG released when fossil fuels are burned produces a net carbon dioxide increase in the atmosphere.

Forest products manufacturing mills use mill residues and byproducts and harvested forest residues to generate onsite energy. The manufacture of its products creates biomass residues and bio-byproducts that are integral and incidental to the pulp and paper and wood products manufacturing processes. There are no economic or environmental alternatives for these biomass residues and byproducts that would prevent CO₂ from entering the atmosphere, and the use of these biomass residues and byproducts for energy avoids the use of coal and other fossil fuels.

Energy Efficiency and Thermal Energy Should be Included in the Definition of “Clean Energy”

AF&PA believes that energy efficiency, biomass used for thermal energy, and waste heat recovery should be included in any CES as qualifying resources.

Thank you for the opportunity to submit this Statement for the Record. AF&PA and its member companies believe that the industry’s considerable contributions to our country’s existing renewable energy base provide an important foundation on which our nation can build a larger renewable energy economy. As our country seeks to encourage additional renewable energy, it is essential that policies are additive to existing producers like the forest products industry rather than a replacement for existing contributors.

We greatly value the Committee’s consideration of our views and would be pleased to answer any questions that the Committee may have, or discuss further any items 4 mentioned in this statement. For additional information, please contact Elizabeth VanDersarl, Vice President of Government Affairs.

STATEMENT OF AMERICAN PUBLIC GAS ASSOCIATION

The American Public Gas Association (APGA) appreciates this opportunity to submit testimony and commends the Committee for holding this important hearing on S. 2146, the Clean Energy Standard Act of 2012.

APGA is the national association for publicly-owned natural gas distribution systems. There are approximately 1,000 public gas systems in 36 states and over 700 of these systems are APGA members. Publicly-owned gas systems are not-for-profit, retail distribution entities owned by, and accountable to, the citizens they serve. They include municipal gas distribution systems, public utility districts, county districts, and other public agencies that have natural gas distribution facilities.

Natural gas is the cleanest, safest, and most useful of all fossil fuels. It is also domestically produced, abundant and reliable. The inherent cleanliness of natural gas compared to other fossil fuels, as well strong domestic supply projections and superior wells-to-wheels efficiency of natural gas equipment, means that substituting gas for the other fuels will reduce the emissions of the air pollutants that produce smog, acid rain and exacerbate the "greenhouse" effect. Natural gas is the lowest CO₂ emission source per BTU delivered of any fossil fuel. Using gas-fired water heaters for homes instead of electric resistance water heaters ultimately reduces greenhouse gas emissions by one-half to two thirds. Simply put, increasing the direct-use of natural gas is the surest, quickest, and most cost-effective avenue to achieve significant reductions in greenhouse gases and therefore should be a critical component of any clean energy legislation.

In June 2009, APGA, the Interstate Natural Gas Association of America and others released a study conducted by the Gas Technology Institute (GTI) entitled "Validation of Direct Natural Gas Use to Reduce CO₂ Emissions." The study analyzed the benefits of increased direct use of natural gas as a cost-effective means to increase full fuel cycle energy efficiency and reduce greenhouse gas emissions. Using the National Energy Modeling System (NEMS), the study concluded that the increased direct use of natural gas will reduce primary energy consumption, consumer energy costs, and national CO₂ emissions.

The study demonstrated, among other things, that conversions to natural gas appliances from their electric counterparts will provide substantially higher and immediate return values in energy efficiency and carbon output reductions than an equal investment in electric applications.

Unfortunately, APGA is concerned that over the years federal policies have moved more toward an all-electric society and have not recognized the benefits of the direct-use of natural gas. One example of this can be found in the manner in which the Department of Energy (DOE) calculates appliance efficiency. The DOE measurement takes into account energy solely consumed at the "site", measuring the energy used by the product itself.

The site-based measurement of energy consumption ignores the energy spent in production, generation, transmission, and distribution. For example, according to DOE's point of use consumer disclosure labels for appliances, an electric water heater may appear to consumers to be over 60 percent more efficient than a gas water heater despite the fact that current national generation, transmission and distribution efficiency for central station electricity is, according to the U.S. Energy Information Agency, only 29.3 percent efficient while the transmission and distribution of natural gas directly to the consumer is 90.1 percent efficient. Ignoring these energy losses makes electric-resistance heating appliances appear more efficient (allowing them to receive a superior DOE efficiency rating).

This site-based measurement has placed natural gas appliances at an unfair marketing disadvantage and as a result there has been a marked increase in shipments of electric water heaters and a decrease in shipments of natural gas water heaters. This increase in electric water heaters will come with an increase in greenhouse gas emissions given that electric water heaters on average emit 2.5 times the amount of greenhouse gas emissions as natural gas water heaters given the current make up of the sources of U.S. electric generation today. Renewable energy generation is poised to grow in the future, but makes up less than 2 percent (excluding hydro-electric) of generation today. Conversion from electric to natural gas appliances will provide a more immediate emissions reduction strategy than the many years it will take for large-scale deployment of wind, solar and other renewable technologies.

Rather than a site-based measurement for energy consumption, APGA has advocated a "source-based" or "full fuel cycle" analysis that measures energy from the point at which energy is extracted through the point at which it is used. Such analysis provides a more accurate assessment of energy use, efficiency, as well as greenhouse gas emissions. The U.S. Government has consistently supported the most efficient use of our natural resources. It has become increasingly important for policymakers to look at the full fuel cycle to find out if we are using our natural resources most efficiently. If there is any question, then we must begin to look at the full fuel cycle when measuring energy usage: consider energy use from the point of extraction, whether fossil fuels from the earth or otherwise, in a continuum through their ultimate usage.

In 2009, the National Academies recognized the importance of measuring efficiency by this method, in its report to Congress, "Review of Site (Point-of-Use) and Full-Fuel-Cycle Measurement Approaches to DOE/EERE Building Appliance Energy Efficiency Standards." The report found that the Department of Energy (DOE) should consider changing its measurement of appliance energy efficiency to one based on the full-fuel-cycle, which takes into account the amount of energy produced and lost from the point of production to the final point of use.

Similarly troubling is the fact that the proposed Clean Energy Standard Act of 2012 does not credit direct use of natural gas in the same manner as other clean energy sources. From a full-fuel-cycle perspective, direct use of natural gas is drastically more efficient at 92 percent system efficiency than electricity, which only reaches 27 percent system efficiency. This legislation is missing the critical component of allowing the option of direct-use of natural gas as a means of meeting the CES. APGA strongly believes that if a utility that provides both natural gas and electric service were to meet new load requirements with the direct-use of natural gas, that utility should receive a credit under a CES in the same manner that it would receive a credit for utilizing clean and/or renewable energy sources for electricity generation. This approach would recognize and take full advantage of the benefits that the direct-use of natural gas provides in terms of efficiency and reduced greenhouse gas emissions. Moreover, it would help reduce the need for additional electricity generation and provide electric/gas utilities with more flexibility in terms of complying with a CES while meeting future load requirements.

At a minimum, the direct-use of natural gas should be included in the Bill's directed study of alternative credited resources. The U.S. Energy Information Agency released its 2012 Annual Energy Outlook on January 23, 2012 with the claim that there are 2140 trillion cubic feet of technically recoverable natural gas resources within the United States. Federal policy should seek to maximize every BTU of this abundant domestic and low-carbon fuel by encouraging greater direct use into our homes and businesses for heating and cooking and other appropriate uses. Direct use into the home would be a far better use of this country's precious natural gas resources.

APGA appreciates this opportunity to submit comments and looks forward to working with the Committee towards fully utilizing the benefits of the direct-use of natural gas in efforts to establish a federal CES.

STATEMENT OF TIMOTHY J. CONSIDINE, SER PROFESSOR OF ENERGY ECONOMICS,
UNIVERSITY OF WYOMING

Executive Summary

This study estimates the contributions of the American steel industry to the U.S. economy. The steel industry is defined here to include two sectors: iron and steel mills and ferroalloys and steel product manufacturing from purchased steel. Based upon data compiled by MIG, Inc. from U.S. Department of Commerce data, the American steel industry directly employed more than 139,000 workers and contributed \$17.5 billion in value added or gross domestic product during 2010.

The economic contribution of the steel industry to the U.S. economy, however, goes beyond these sector specific measures because steel companies purchase inputs from many other sectors of the U.S. economy. Moreover, the steel industry contributes to household income, which then induces additional rounds of stimulus to the economy as households spend this income on goods and services. For instance, during 2010 the steel industry purchased more than \$20 billion of materials produced in other industries, \$8 billion of services, \$5 billion of energy products, \$4.5 billion of machinery, \$4.4 billion from wholesale and retail trade sectors, more than \$4 billion of transportation services, and generated \$12.4 billion in labor income. Clearly, the steel industry supports businesses and jobs in many sectors of the U.S. economy.

To map these interdependencies, this study employs an input-output table of the U.S. economy with the IMPLAN system from MIG, Inc. to estimate these indirect or supply chain impacts as well as the impacts induced by the spending of household income contributed directly and indirectly by the steel industry. Our economic impact analysis indicates that the steel industry directly contributed \$17.5 billion of value added, \$40 billion indirectly via supply chain spending, and induced another \$35.8 billion as households spent their income generated from these activities. So in terms of net contribution to the U.S. economy the American steel industry contributed \$93.4 billion to gross domestic product during 2010. Likewise, the steel industry directly employs over 139,000 workers, supports another 360,986 workers indirectly through the supply chain, and induces spending by households that sup-

ports another 443,002 jobs in other sectors of the economy. In total the steel industry supported 943,045 jobs in the U.S. economy during 2010.

With higher levels of steel sales during 2011, the American steel industry contributes \$101.2 billion to gross domestic product, and generates \$22.9 billion in tax revenues at the federal, state, and local level, for a gross economic output of over \$246 billion. Since steel is the most prevalent material in our economy, the steel industry is highly interrelated with other economic sectors, as reflected in the ripple effect on employment. Every one job in the U.S. Steel industry creates seven jobs in the U.S. economy. For 2011, the industry directly employs 150,700, and given the multiplier effect, supports more than 1,022,009 jobs.

Definition of Steel Sector

The steel industry in North America is instrumental in supplying the material requirements for construction, manufacturing, and energy industries. For this study, the steel sector is defined to include two industries in the North American Industrial Classification System (NAICS): iron and steel mills and ferroalloy manufacturing and steel products manufactured from purchased steel. The former includes both integrated and electric arc furnace steel producers and companies producing ferroalloy inputs to steel making, including ferrochrome, nickel, and related products. The latter category includes steel pipe and tube manufacturers and companies rolling and drawing purchased steel to produce finished steel products. Given the close overlap of these two industrial sectors, this study combines these sectors into one so-called steel sector.

Employment, labor income, and value added for the steel sector are reported below in Table 1. The iron and steel mill and ferroalloy segment is the largest component of the steel sector with more than 86,000 employees, \$8.3 billion in labor income, and \$12.6 billion in value added, which is defined to include payments to labor and capital inputs, including profits, proprietor income, and indirect business taxes. The manufacturing of steel products from purchased steel requires more than 52,000 workers who generate \$4 billion in labor income and nearly \$5 billion in value added. Together these two sectors employ more than 139,000 and generate \$12.4 billion in labor income and \$17.5 billion in value added (see Table 1).

Table 1: Definition of steel sector in 2010

Industry	Employment	Million dollars		
		Labor Income	Value Added	Gross Output
Iron and steel mills and ferroalloys	86,461	\$8,323	\$12,559	\$60,043
Steel products from purchased steel	52,595	\$4,015	\$4,969	\$23,428
Steel Sector	139,056	\$12,338	\$17,528	\$83,471

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

The direct tax impacts associated with steel sector activity appear below in Table 2. Tax revenues are paid from contributions to social security, proprietor income, indirect business taxes, household income, and corporate profits. During 2010, the steel sector paid a total of \$3.7 billion in federal, state, and local taxes, \$1.453 billion in social security taxes, \$1.1 billion of income taxes on household income and \$350 in corporate taxes earned from the steel sector, and \$772 of indirect business taxes, and \$9 million of taxes on proprietor income (see Table 2).

Table 2: Direct tax impacts of the steel sector in 2010

Federal Taxes	Employee Compensation	Proprietor Income	Indirect Business Tax	Households	Corporations	Total
Social Security						
Employee	715	9				724
Employers	705					705
Indirect Business Taxes						
Excise Taxes			49			49
Custom Duty			19			19
Fed Non-Taxes			33			33
Corporate Profits Tax					298	298
Personal Income Tax				785		785
Total Federal Tax	1,421	9	101	785	298	2,613
State & Local Taxes						
Dividends					2	2
Social Security						
Employee	10					10
Employers	22					22
Indirect Business Taxes						
Sales Tax			293			293
Property Tax			288			288
Motor Vehicle Lic			6			6
Severance Tax			8			8
Other Taxes			42			42
S/L NonTaxes			34			34
Corporate Profits Tax					52	52
Personal Taxes						
Income Tax				234		234
NonTaxes (Fines-Fees)				65		65
Motor Vehicle License				14		14
Property Taxes				7		7
Other Tax (Fish/Hunt)				6		6
Total State and Local Tax	32	0	671	325	52	1,081
Total Taxes	1,453	9	772	1,110	350	3,694
Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)						

Labor and multifactor productivity growth continues to allow the industry to produce higher quality output with fewer labor hours. Given this and pressures from international competition, employment levels in the steel sector are down from levels in 2002 (*see Figure 1). After a painful period of restructuring, employment steadily declined from 2002 to 2006 until a rebound in 2007-2008. After a sharp fall in value added and employment in the steel sector during 2009, the steel industry recovered during 2010 and recent indications suggest that this recovery is continuing through early 2012.

This employment and the industry's purchases of energy, materials, and supplies for the production of steel stimulate economic output and employment in other sectors of the U.S. economy. Since steel is the most prevalent material in our economy, the steel industry is highly interrelated with other economic sectors.

In understanding the role of the steel industry in the economy, the first step is to identify the industry's purchases of inputs from other industries. A tabulation of these transactions for 2010 is reported below in Table 2. These estimates are obtained by using the definition of the steel sector used in Table 1 above. To simplify

* Figure 1 has been retained in committee files.

the presentation, these transactions are classified into several major categories for values greater than \$100 million with sub-categories reported below each item.

The largest category is materials, such as scrap and iron ore, comprising nearly 31 percent of inter-industry purchases. The steel sector purchased \$9.8 billion of iron and steel scrap, \$2.9 billion of steam and metallurgical grade coal, \$2.4 billion of iron ore, and \$1.1 billion of primary nonferrous metals. Industrial gas purchases totaled \$739 million while refractory materials amount to \$592 million, and non-ferrous metal product purchases were \$485 million. In total, the steel sector supports \$20 billion in sales of materials, cutting across a broad swatch of the mining and manufacturing sectors of the U.S. economy.

Somewhat surprisingly, the next largest category of inputs to the steel sector at nearly \$8 billion is a broad range of services. Management services, services for buildings, securities and investment services, legal, and architectural and specialized design services are the top six service categories, comprising almost 42 percent of purchases of services by the steel sector. The third largest category of purchases by the steel sector is from energy industries with nearly \$5 billion in transactions between these two sectors. Sales of machinery, wholesale and retail trade, and transportation to the steel sector are each more than \$4 billion (see Table 2). Computers and electronics provide \$1.6 billion to the steel sector.

Sales between the two major segments of the steel sector amount to \$18 billion so that total inter-industry purchases from other industries to the steel sector amounted to nearly \$66 billion in 2010. Value added or gross domestic product generated by the steel industry is \$17.5 billion during 2010 with \$12.3 billion compensating employees and the remaining \$5.2 billion going to payments for capital resources and to governments via taxes.

Table 2: Inter-industry purchases by steel sector in 2010

<i>Industrial Category</i>	<i>\$ Million</i>	<i>Industrial Category</i>	<i>\$ Million</i>
<i>Services</i>	7,973	<i>Wholesale & Retail Trade</i>	4,443
Management of enterprises	1,179	<i>Energy</i>	4,980
Services to buildings	677	Power generation & supply	2,366
Securities & investments	443	Natural gas distribution	1,768
Architectural engineering	365	Petroleum refineries	487
Legal	345	Petroleum lubricants	215
Specialized design	338	Other energy and utilities	144
Automotive	337	<i>Transportation</i>	4,092
Waste management	306	Transport by rail	2,047
Monetary credit	290	Transport by truck	1,778
Miscellaneous professional	289	Transport by air	153
Repair and maintenance	272	Other transportation	113
Business support services	258	<i>Computers & Electronics</i>	1,588
Automotive rental	247	Semiconductors	657
Employment services	245	Printed circuits	413
Telecommunications	238	Industrial control	288
Real estate establishments	180	Lighting & other electronics	229
Consulting services	171	<i>Materials</i>	29,626
Food services and drinking	161	Scrap	19,140
Accounting	152	Mining coal	2,933
Warehousing and storage	150	Mining iron ore	2,359
Other support services	148	Primary nonferrous metal	1,076
Advertising	145	Industrial gas	739
Lessors of nonfinancial assets	139	Clay and non-clay refractory	592
Security	117	Nonferrous metal products	485
Other services	779	Lime and gypsum	355
<i>Machinery</i>	4,493	Paperboard container	323
Material handling	1,382	Mineral and earth	311
Maintenance and repair	915	Alumina & aluminum	287
Coating & heat treating	284	Ferrous metal foundries	225
Carbon and graphite	279	Inorganic chemicals	123
Machine shops	266	Other plastics	109
Ball and roller bearing	224	Other organic chemicals	100
Other fabricated metal	213	Other materials	469
Motor vehicle parts	178	<i>Steel intra-industry sales</i>	8,726
Special tool, die, & jig	173	<i>Total Intermediate</i>	65,921
Pump and pumping	146	<i>Total Value Added</i>	17,528
Spring and wire	116	<i>Employee Compensation</i>	12,338
Plate work & other	317	<i>Total Industry Output</i>	83,449

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

Methodology

These transactions between the steel sector and other industries determine the impact of the steel industry on the U.S. economy. Economists have devised several measures of these economic impacts that are calibrated to changes in output or final sales. The first are so-called direct impacts reported above in Table 1 in which changes in final steel sector sales directly affect output, employment, labor income, or value added.

If steel sector sales increase then a second round of economic impacts above and beyond the direct impacts occurs as the steel sector purchases inputs to make steel for shipment to customers. These changes are known as indirect impacts and reflect

the supply chain stimulus that the steel sector provides. This is one reason why so many countries around the world welcome investments that establish steel mills because they stimulate industrial supply chains. These indirect impacts support jobs in industries supplying the steel industry with inputs of energy, materials, and services, such as those discussed above in Table 2. The sum of the direct and indirect effects divided by the direct impacts are called Type I multipliers.

The third and final set of economic impacts arises from the stimulus that additional labor and capital income provides for households to spend on goods and services. For example, the direct and indirect impacts discussed above increase income to households. This additional income induces consumers to spend more on goods and services, which provides an additional round of stimulus through the direct and indirect channels discussed above. These so-called induced impacts together with the direct and indirect impacts constitute the “total” economic impact of the industry. The ratio of this total impact to the direct impacts is known as a Type II multiplier.

Estimates of Steel Industry Economic Impact

These economic multipliers are calculated for every industry in the United States economy by a variety of government agencies and private companies using the input-output tables collected and published by the U.S. Department of Commerce, Bureau of Economic Analysis. This study employs the IMPLAN (Impact analysis for PLANing) system developed by MIG, Inc., one of the most widely used and highly regarded systems for economic impact analysis.¹

A summary of the economic multipliers for the two major steel industry related sectors discussed above are presented below in Table 3. For every dollar increase in sales for iron and steel mills and ferroalloy industries, total output in the U.S. economy increases by \$2.66, \$1 is the direct sales increase, another \$0.94 dollars arise from indirect or supply chain impacts, and the remaining \$0.73 is generated from the induced impacts as workers and asset holders spend the additional income generated from the direct and indirect impacts (see Table 3). The Type I multiplier of 1.935 means that for every dollar increase in sales for iron and steel mills and ferroalloy industries total output increases \$1.94 (see Table 3). The Type II multiplier is 2.66 indicating that for every dollar increase in steel sales, the total economic impact is \$2.66. The multipliers for steel products made from purchased steel are slightly larger than for iron and steel mills and ferroalloy manufacturers.

The employment multipliers reported below in Table 3 are measured in jobs per million dollars of gross output. For instance, for every one million dollars of final output, 1.44 jobs are supported directly by the iron and steel mills and ferroalloy industry, which is simply the ratio of employment in this sector 86,461 to gross output of \$60,043 million reported in Table 1. With indirect and induced effects, this industry and steel products produced from steel support 10.87 and 12.74 jobs respectively. Labor income multipliers and value added are also reported in Table 3 and reflect the dollar changes in each of these components for a dollar change in final sales.

¹ http://implan.com/V4/index.php?option=com_content&view=frontpage&Itemid=1

Table 3: Economic multipliers for steel related manufacturing sectors in 2010

	Direct	Indirect	Induced	Total	Type I	Type II
Output Multipliers						
Iron and steel mills and ferroalloys	1.000	0.935	0.730	2.665	1.935	2.665
Steel product from purchased steel	1.000	1.117	0.799	2.916	2.117	2.916
Employment (per million of output)						
Iron and steel mills and ferroalloys	1.440	4.227	5.204	10.871	3.936	7.549
Steel product from purchased steel	2.245	4.803	5.693	12.740	3.139	5.675
Labor Income						
Iron and steel mills and ferroalloys	0.141	0.280	0.235	0.656	2.991	4.661
Steel product from purchased steel	0.174	0.309	0.257	0.741	2.776	4.253
Total Value Added						
Iron and steel mills and ferroalloys	0.209	0.478	0.421	1.108	3.285	5.296
Steel product from purchased steel	0.212	0.505	0.460	1.177	3.379	5.549

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

An aggregate of these two sectors is formed to calculate multipliers for the entire sector. These multipliers are reported below in Table 4 and measure the economic impacts of the steel industry on the U.S. economy. For instance, the steel industry supports 2.722 dollars of output for every dollar of steel industry sales. This multiplier implies that for the current steel industry gross output or sales of \$83.5 billion (see Table 1), \$227.3 billion in total gross output is generated.

A more meaningful measure of economic impact, however, that avoids double counting is value added or gross domestic product. Using this measure, the steel industry contributed \$17.5 billion of valued added directly, \$40 billion indirectly via supply chain spending, and \$35.8 billion as households spend their income generated from these activities. In summary, the net contribution to the U.S. economy by the steel industry is \$93.4 billion.

In terms of employment, for every million dollars of gross output 11.298 jobs are supported. Another way to express the employment impacts is with the Type I and Type II multipliers. For example, for every one job directly created in the steel industry, 3.596 jobs are supported via supply chain impacts and 6.782 jobs are created from the stimulus emanating from industries that supply steel inputs and from households as they spend the additional income that this activity generates. In summary, for every one job directly created in the steel industry seven jobs are created the U.S. economy.

These multipliers also imply that the direct steel industry employment of 139,000 workers, supports another 360,986 workers indirectly through the supply chain, and induces spending by households that supports another 443,002 jobs in other sectors of the economy. In total the steel industry supported 943,045 jobs in the U.S. economy during 2010. With higher levels of steel sales, it would fair to say that the American steel industry supports more than one million jobs.

Table 4: Economic multipliers for aggregate steel sector in 2010

Multiplier	Direct	Indirect	Induced	Total	Type 1*	Type 2**
Output	1.000	0.977	0.745	2.722	1.977	2.722
Labor Income	0.150	0.285	0.240	0.675	2.900	4.498
Value Added	0.210	0.480	0.429	1.119	3.285	5.328
	<u>Jobs or tax \$ per million of gross output</u>					
Employment (per million of output)	1.666	4.325	5.307	11.298	3.596	6.782
Federal Taxes	31,305	64,657	56,194	152,154	3.065	4.860
State and Local Taxes	12,979	46,363	41,704	101,046	4.572	7.785
Total taxes	44,284	111,020	97,898	253,200	3.507	5.718

* Ratio of direct plus indirect to direct impacts.

** Ratio of total to direct impacts.

Source: Computations of author using IMPLAN 3 based upon data from MIG, Inc.

The tax multipliers are also displayed below in Table 4. For every million dollars of gross output in the steel sector, \$152,154 of federal tax revenues and \$101,046 of state and local tax revenues are generated. Using total gross output of \$83.5 billion, the steel sector generated \$21.2 billion in federal and state and local taxes during 2010, \$3.7 billion directly, \$9.1 billion indirectly from supply chain interactions, and \$8.2 billion from induced impacts.

Estimates of Steel Industry Economic Impact

The economic contributions of the steel sector presented above are based upon the IMPLAN input-output tables of 2010. These estimates are updated for 2011 based upon preliminary data for employment in the steel sector reported by the Bureau of Labor Statistics. The preliminary estimate for direct steel sector employment in 2011 is 150,700. This level of employment is consistent with gross output of \$90.461 billion and valued added of \$18.996 billion (see Table 5). Given the multipliers presented above, the steel sector in 2011 supported 1,022,009 jobs in the U.S. economy and contributed \$101.211 in value added, and \$246.213 in gross output (see Table 5). Given the tax multipliers presented above, during 2011 the steel sector generated \$22.9 billion in local, state, and federal taxes (see Table 5).

Table 5: Economic contributions of steel sector in millions of current dollars

	Direct	Indirect	Induced	Total
Employment	150,700	391,213	480,096	1,022,009
Value Added	18,996	43,405	38,811	101,211
Gross Output	90,461	88,365	67,387	246,213
Total Taxes	4,006	10,043	8,856	22,905

Disaggregation of Steel Sector Multipliers

The multipliers appearing in Table 4 are disaggregated by industry in Table 6, sorted by employment impacts from highest to lowest. For instance, the 11.298 employment multiplier is the summation of employment impacts by sector appearing in Table 5. The steel sector contributes 1.963 jobs of this total. The next largest category is professional, scientific, and technical services with 1.743 jobs per million dollars of gross output. The third largest category is repairs and related services. Education and health care and business support services each contribute slightly over one job per million dollars of gross output. In summary, these top five industries together constitute about 65 percent of the total employment impact. The next five industries, retail trade, wholesale trade, transportation, machinery and equipment, and mining comprise slightly over 22 percent of the employment impact. The remaining 13 percent is distributed across a broad swatch of the U.S. economy (see Table 5).

Table 6: Final demand multipliers by industry for steel sector

	Final Demand Type II Multipliers		
	<i>Output</i>	<i>Labor Income</i>	<i>Employment</i>
	(1)	(2)	(3)
Steel	1.178	1.178	1.963
Professional, scientific, and technical services	0.363	0.687	1.743
Repairs and other services	0.096	0.274	1.470
Education & Health Care	0.095	0.365	1.076
Business support services	0.086	0.318	1.076
Retail Trade	0.055	0.170	0.850
Wholesale Trade	0.102	0.299	0.594
Transportation	0.087	0.228	0.523
Machinery & Equipment	0.070	0.119	0.289
Mining	0.094	0.190	0.281
Publishing & Media	0.032	0.077	0.208
Construction	0.025	0.069	0.204
Government	0.029	0.072	0.138
Agriculture & Forestry	0.015	0.024	0.130
Electricity, Natural Gas, Utilities	0.076	0.096	0.106
Petroleum, Chemicals, Plastics	0.106	0.071	0.095
Wood, Paper, Printing	0.024	0.034	0.082
Electronics	0.036	0.051	0.080
Information	0.032	0.039	0.074
Food & Kindred Products	0.041	0.027	0.073
Stone, Clay, and Glass	0.021	0.028	0.057
Other Metals	0.023	0.027	0.053
Waste Management Services	0.010	0.020	0.049
Transportation Equipment	0.016	0.018	0.034
Misc. Manufacturing	0.004	0.009	0.020
Textiles & Leather Products	0.003	0.005	0.018
Wood Products	0.002	0.004	0.013
Total Impacts	2.722	4.498	11.298

Source: MIG, Inc. (Formerly Minnesota IMPLAN Group, Inc.)

- (1) Each entry in column 1 measures the total dollar change in output in the industry corresponding to each row that results from a \$1 change in output delivered to final demand by the steel industry
- (2) Each entry in column 2 measures the total dollar change in earnings of households employed in the industry corresponding to each row that results from a \$1 change in output delivered to final demand by the steel industry
- (3) Each entry in column 3 measures total change in the number of jobs in the industry corresponding to each row from a \$1 million change in output delivered to final demand by the steel industry

STATEMENT OF THE AMERICAN CHEMISTRY COUNCIL

The American Chemistry Council (ACC) is pleased to comment on the Clean Energy Standard Act of 2012 (“CESA” or “Act”). ACC believes that in order for our economy to grow, U.S. industries to innovate and compete globally, and businesses to create new jobs, a national energy strategy that provides for innovation as well as efficient, cost-effective and reliable generation of electricity is critical. Policies must allow us to capitalize on all of our domestic energy resources; prioritize greater energy efficiency in homes, buildings and industrial facilities; and encourage the adoption of diverse energy sources, including renewable energy and energy recovery from plastics and other materials. Unfortunately, CESA falls short of these objectives and would significantly raise electricity costs of industry and households.

We think there are better ways to meet the objectives of a national energy strategy. As an energy-intensive industry we know that high-cost purchased power can jeopardize our industry’s global competitiveness. In the short term, policy should favor the deployment of the most economically efficient power generation, consistent with the policy objective. In the long term, policy should encourage a diverse mix of technologies, including clean coal energy systems. Economically efficient genera-

tion varies in different parts of the country, so policy should avoid one-size fits all solutions and should avoid picking winners and losers. The nation is already moving toward a cleaner energy portfolio so it is fair to ask, are additional policy instruments needed in pursuit of a lower carbon economy?

Americans agree that a national energy strategy is needed. According to a recent national survey conducted by Washington-based Clarus Research Group, an overwhelming majority of voters (94 percent) believe that a “comprehensive energy policy is essential to building a strong economy, creating new jobs, and making America more competitive with other countries.”

The chemistry industry is the foundation of America’s manufacturing sector, Chemistry creates the basic building blocks for countless products Americans rely on every day, as well as 96 percent of all manufactured goods made in the United States. Abundant, affordable domestic natural gas has created a new competitive edge for American chemistry, and it’s driving a renaissance in U.S. manufacturing.

Chemistry companies are tremendous sources of American innovation—essential to addressing our energy challenges and building and maintaining our competitive position in the world. One in five U.S. patents is chemistry-related. Chemistry is the source of essential materials and technologies for energy efficiency and renewable and alternative energy. Building insulation, photovoltaics, advanced batteries, lightweight plastic vehicle parts, and fuel innovations are among the many sustainable solutions made possible by chemistry. Our industry can help enable a strong, secure and sustainable future for the United States.

The energy savings are impressive. A recent ACC study found that the use of chemistry in energy-saving products and technologies helps save up to 10.9 quadrillion Btus of energy annually, enough to power up to 56 million households or up to 135 million vehicles each year, and saving Americans up to \$85 billion in energy costs annually.

With so much at stake, we have carefully examined the Clean Energy Standard Act of 2012 (S. 2146), which would have far-reaching impacts on the power sector and its customers. While ACC supports the bill’s objectives to encourage growth of clean energy sources of generation, we have considerable reservations about how the bill would achieve its goals.

First, we are concerned about a policy that sets 20 plus years of ever increasing clean energy thresholds that apparently were chosen without concern about costs. No one knows the cost impact of these regulations, but power rates are very likely to soar.

Second, it is not clear to us that a clean energy standard with arbitrary thresholds is needed to continue on a path toward a clean energy economy. The national economy is rapidly moving toward cleaner energy technologies. Federal air quality standards and state renewable energy standards will accelerate the shift toward low carbon power generation in the years to come. Given the suite of existing and forthcoming federal and state policies there may be little compelling need for CESA.

Third, ACC believes that energy efficiency should be a cornerstone of any national energy policy, on par with other clean energy sources. Yet under CESA, energy efficiency improvements at an electric utility or manufacturing facility do not receive credits toward compliance with the Act. Investments will focus on credit-receiving clean energy technologies. CESA’s approach will result in lower investment in energy efficiency and comparatively higher utility bills for rate payers.

A better option can be found in S.1000, the Energy Savings and Industrial Competitiveness Act, introduced by Senators Shaheen and Portman. Congress should pass S. 1000 this year. It contains provisions to achieve energy savings across the economy, including building energy codes, appliance standards and a manufacturing energy efficiency program. The bill will help industries identify new energy efficiency opportunities and pave the way for additional programs to harness the potential of industrial energy efficiency.

Fourth, national energy policies must be fair to all regions of the country, recognizing differences in their energy resource endowments. CESA will create inequities for areas that rely heavily on coal. As a result, compliance costs can vary widely across the country. Manufacturers are likely to be especially hard hit: Energy-intensive industries in coal-dependent states will face higher electricity rates, putting them at a competitive disadvantage with businesses from lower-compliance-cost states.

Fifth, ACC supports an “all of the above” approach to energy policy, but CESA discourages sources that are critical to America’s energy portfolio. For example, the bill discourages coal-fired power from the date of enactment. Later in the program, natural gas-fired generation would no longer qualify for credits. Faced with a reduced portfolio of credit-receiving clean energy technologies power rates are very likely to soar in many parts of the country. Again, energy-intensive industries in

hard-hit regions will be placed at a competitive disadvantage. The implications for the cost of energy to ratepayers, for our economic recovery, and for American jobs are clear.

In addition, we are concerned that the CES as proposed treats all qualified renewable biomass the same way, which has commercial and environmental implications. Bio-based feedstocks like black liquor soap, crude tall oil, and crude sulfate turpentine can be, and are, converted into high-value chemicals and products. However, they can also be burned as a fuel. The highest and best use of the biomass, based on both commercial considerations and environmental considerations taking life cycle impacts into account, may therefore be to create bio-based chemicals or products from the biomass and not use it as an energy source. A policy that incentivizes their use as bio-energy can distort the market to the disadvantage of bio-based chemical producers.

On a positive note, we are pleased to see that CESA qualifies new combined heat and power (CHP) installations for the standard. CHP can and should play a major role in the nation's clean energy future. Because CHP facilities create two forms of energy—electricity and steam—with the same amount of fuel, they are often twice as efficient as older coal-burning electric utilities. By 2030, the U.S. can meet 20 percent of its electricity needs from high-efficiency CHP, according to the Oak Ridge National Laboratory.

Regrettably, while CESA includes CHP, it is not placed on a level playing field with other qualified clean energy sources. Under the bill, CHP put in place prior to enactment is not considered “clean energy,” while other qualified technologies placed in service after 1991 are eligible to receive credits.¹ The legislation does award clean energy credits to owners of qualified heat and power systems for avoided greenhouse gas emissions where the facility is used for on-site thermal needs. Facilities that are able to meet the bill's definitions of useful electric and thermal energy generation may benefit through the award of credits for this activity. This provision recognizes the full value of CHP as a cost-effective and energy efficient source of thermal heat and power.

Energy recovery is another important provision in CESA. ACC supports increased adoption of energy recovery technologies to capture abundant amounts of energy, particularly from non-recycled plastics. Used plastics have a higher Btu value than coal and can be converted into electricity, motor fuels and valuable chemicals. Recovering this energy complements recycling and reduces waste that would otherwise be sent to landfills. CESA classifies certain energy recovery facilities as qualified clean energy. However, we are concerned that over time, these facilities may not be able to meet the carbon intensity standard established by CESA unless they can employ carbon capture and sequestration technology soon.

In sum, ACC supports the growth of the clean energy economy. America's chemical industry is a major supplier of the innovative solutions needed. We question the need for legislation that duplicates market trends already underway as a result of other regulations. We support policies that implement “all of the above” energy strategies. In its current form, CESA immediately disadvantages coal, would eventually disadvantage natural gas, and excludes energy efficiency from qualification for clean energy credits. By limiting the nation's energy options, the Act will result in higher electricity rates that could put energy-intensive industries at a competitive disadvantage in the global marketplace. We think there are better ways to meet the objectives of a national energy strategy.

STATEMENT OF STEVEN NADEL, EXECUTIVE DIRECTOR, AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

Introduction

I am pleased to submit this statement for the record in conjunction with the hearing today on S. 2146.

We thank Senator Bingaman and his cosponsors for introducing this bill to create a national clean energy standard (CES) as it helps advance the discussion on ways to encourage a cleaner electricity supply in the United States. We think a national CES would be very useful for spurring a gradual transition from today's current electricity supply mix to one that is much cleaner, thereby advancing our environmental objectives while also helping to build a strong economy. In particular, we appreciate that the bill includes combined heat and power (CHP) as an eligible re-

¹Under Section 610(b)(1)(A), facilities placed in service after 1991 using natural gas are defined as “clean energy” while Section 610(b)(1)(B) considers combined heat and power facilities to constitute “clean energy” only if they are placed in service after the date of enactment.

source. Expanding use of CHP in the United States is an important approach for saving energy, reducing costs, and reducing emissions because CHP systems are significantly more efficient than separate power generation and steam systems. However, we are troubled by the fact that S. 2146 relegates other energy efficiency savings to second class status—energy efficiency is not included in the initial CES but instead is left to a report that will make recommendations to Congress but that will require further congressional action down the road in order to add energy efficiency to the standard.

We strongly urge that S. 2146 be amended to explicitly include energy efficiency as an eligible resource. Energy efficiency should be included because:

1. Energy efficiency is generally the lowest cost resource available to electricity providers. Including energy efficiency will reduce the cost to consumers of a CES.
2. Energy efficiency is generally the cleanest resource.
3. Energy efficiency standards for electric utilities work—half the states now have and are successfully implementing such energy efficiency standards.
4. Exclusion of energy efficiency from the CES tilts the playing field, increasing rather than decreasing the barriers to energy efficiency.
5. Energy efficiency will create more jobs—investments in energy efficiency generate more jobs per dollar invested than other electricity resources.

In the paragraphs below we elaborate on these points and also make some suggestions on how energy efficiency can be incorporated into a national CES.

Including Energy Efficiency Will Reduce the Cost of a CES

Energy efficiency is generally the least expensive resource available to power providers as shown in the graph below. Energy efficiency generally has costs to the power provider of less than half the next cheapest options.

Graph Sources—Energy efficiency data were gathered from 14 states and compiled in an ACEEE study.¹ All other data from Lazard Ltd.²

Since energy efficiency is lower cost than other resources that will be encouraged under the CES, inclusion of energy efficiency will reduce the cost of the CES. This is illustrated by the November 2011 report by EIA that analyzed several CES options.³ While the primary analysis did not include energy efficiency, one of the alternative cases that EIA examined illustrated the positive impacts of energy efficiency in reducing the costs of a CES. Specifically, the analysis included a case in which electricity use would be reduced by 6.7 percent in 2035 as a result of stronger energy efficiency standards and building codes. EIA found that these energy efficiency savings reduced the annual cost of the Basecase Clean Energy Standard (BCES) by \$57 billion in 2035, the last year of the analysis. These savings include \$44 billion in lower annual electricity expenditures and \$13 billion in lower annual natural gas expenditures outside of the power sector. Electricity costs decline because electricity use is down and because electric rates are lower (by an average of 0.3 cents per kWh) than in the BCES case. The savings in electricity also mean that less natural gas is needed by the electric power sector, reducing natural gas demand and lowering the price of natural gas for all users by an average of 40 cents per thousand cubic feet.

The energy efficiency standards and codes case that EIA examined included only modest efficiency savings—i.e., the 6.7 percent saved in 2035 works out to an average reduction of 0.3 percent per year. ACEEE's recent State Energy Efficiency Scorecard⁴ found that five states (Vermont, Nevada, Hawaii, Rhode Island, and Minnesota) are already saving more than 1 percent per year, not including standards and codes, with the highest saving at 1.6 percent per year. Many other states are now ramping up to these levels of savings. Allowing energy efficiency to fully participate in a CES would potentially increase the efficiency savings by a factor of 3-5 compared to the case EIA examined. So if 6.7 percent energy efficiency savings saves \$57 billion, then 20 percent efficiency savings will likely save considerably more—reducing the cost of electricity services with a CES to less than the cost

¹Friedrich, Katherine, Maggie Eldridge, Dan York, Pattie Witte, and Marty Kushler. 2009. Saving Energy Cost-Effectively: A National Review of the Cost of Energy Saved Through Utility-Sector Energy Efficiency Programs. Report U092. <http://www.aceee.org/research-report/u092>. Washington D.C.: American Council for an Energy-Efficient Economy.

²Lazard, Ltd. 2011. Levelized cost of energy analysis-version 5.0 New York, NY: Lazard Limited. http://j.mp/Lazard_LCOE_ver5

³EIA. 2011. Analysis of Impacts of a Clean Energy Standard as requested by Chairman Bingaman. Washington, DC: Energy Information Administration.

⁴Sciortino et al. 2011. State Energy Efficiency Scorecard. Washington, DC: American Council for an Energy-Efficient Economy. <http://www.aceee.org/research-report/e115>.

of electricity services if no CES were enacted. Of course this is a rough approximation; we recommend that EIA be tasked with conducting a specific analysis on this scenario.

Including Energy Efficiency Will Reduce Emissions

The cleanest power is power we do not need to produce. A primary purpose of the CES is to reduce emissions of criteria pollutants (e.g. nitrogen oxides) as well as greenhouse gases. The November 2011 EIA analysis discussed above found that relative to the BCES, including efficiency savings from standards and codes would reduce 2035 nitrogen oxide emissions by 7 percent, mercury emissions by 6 percent and carbon dioxide emissions by 14 percent. If energy efficiency is added to the CES, energy efficiency savings will be much greater than just the standards and codes savings that EIA modeled, producing even larger emissions savings.

Energy Efficiency Resource Standards Are in Place in Half the States and Have Been Proven to Work

Twenty-five states now have mandatory energy efficiency targets. We call these Energy Efficiency Resource Standards (EERS). This includes two states (Nevada and North Carolina) with a combined EERS/Renewable Energy Standard. These states are shown in the map* below. A 2011 evaluation of EERS implementation in the 19 states that have been implementing their EERS for at least two years found that that all but three states are meeting or close to meeting their targets.⁵ One of the three has since caught up. In addition, our 2011 State Scorecard (referenced above) found that eight other states (Connecticut, Idaho, Montana, Nebraska, New Hampshire, New Jersey, South Dakota and Utah) plus the District of Columbia have used energy efficiency in the most recent year to save at least 0.2 percent of electricity sales. Thus, a substantial majority of states are already implementing significant energy efficiency programs, allowing them to quickly ramp-up activities to help meet early-year CES targets at modest cost.

Excluding Energy Efficiency from the CES Unfairly “Tilts the Playing Field”

Energy efficiency and natural gas are now often competing in the market as the low-cost resources for meeting electricity needs. It makes no sense to “put a finger on the scale” and allow only natural gas to participate in a CES, and not energy efficiency as that would create a market incentive for utilities to invest in new natural gas power plants instead of energy efficiency programs. In order to “level the playing field,” energy efficiency should be added to the CES. If there is a concern that this would mean that the resulting mix does not adequately promote renewable energy and other advanced energy sources, then the targets can be increased. Energy efficiency produces no emissions and therefore is “cleaner” than many of the resources now included in CES proposals.

Alternatively, if the intent of the CES is not to reduce emissions but is instead designed to encourage use of advanced, low-carbon resources that have difficulty competing with efficiency and natural gas, then the standard could be retitled an Advanced Energy Standard, and only more expensive energy sources that need some help (e.g., renewables, nuclear, and coal with carbon capture and storage) would be included. In such a case, the targets would need to be lower than those now in S. 2146.

Including Energy Efficiency Will Create More Jobs

Energy efficiency measures tend to be labor intensive, creating more jobs than capital-intensive investments such as power plants. ACEEE economic analyses have generally found that energy-efficiency investments generate about 20 jobs per million dollars invested (includes direct, indirect, and induced jobs) while investments in the energy sector generate about 10 jobs per million dollars invested.⁶ The net difference is about 10 jobs per million dollars invested.

In 2009, ACEEE examined the job impacts of an EERS that reduces nationwide electricity use by 15 percent in 2020 and natural gas use by 10 percent in 2020. Based on a detailed input-output economic analysis, we concluded that such a policy would, by 2020, create 222,000 net jobs relative to the EIA Reference Case scenario (net jobs means jobs from efficiency investments after adjusting for the fact that

*The map has been retained in committee files.

⁵Sciortino et al. 2011. Energy Efficiency Resource Standards: A Progress Report on State Experience. Washington, DC: American Council for an Energy-Efficient Economy. <http://www.aceee.org/research-report/u112>.

⁶<http://www.aceee.org/files/pdf/fact-sheet/ee-job-creation.pdf>.

lower electricity demand results in fewer power plants and reduces the amount of fuel needed for power generation).⁷ These are a substantial number of jobs.

Incorporating Energy Efficiency into a National CES

In terms of modifying S. 2146 to include energy efficiency, we recommend that definitions and implementation provisions be drawn from S. 548, introduced by Senator Schumer in the 111th Congress. Using this approach, the legislation would establish evaluation principles and DOE would establish national guidelines for evaluation of energy efficiency savings. DOE could draw on its own prior work as well as regional evaluation guidelines that have been developed in the northwest⁸ and are now being developed in the northeast.⁹ States or utilities and their contractors would be responsible for conducting evaluations. We recommend that states be encouraged to oversee utility implementation of the evaluation portions of the CES, including reviewing and approving evaluations. DOE would review such state-approved evaluations on a spot basis to see where the evaluation guidelines needed to be improved and to look for any gross abuse. In addition, if a state Public Utility Commission elected not to review utility evaluations, then DOE would need to conduct this review. Furthermore, since energy efficiency opportunities exist in all states, we do not think interstate trading of energy efficiency credits is needed or desirable. Trading of energy efficiency credits would add unneeded complication and would mean that some states will not get their share of energy efficiency benefits. Intrastate trading could be allowed with approval of the state Public Utility Commission.

Conclusion

Energy efficiency is our cheapest and cleanest energy resource. In order to reduce the cost of the CES and also further reduce electric sector emissions, energy efficiency should be included in the CES. Including energy efficiency will save money so that we can better afford to use advanced energy resources such as renewables, nuclear and coal with carbon capture and storage to meet the balance of our future energy demand. S. 2146 should be amended to specifically include energy efficiency as an eligible clean energy resource.

STATEMENT OF THE BIOMASS POWER ASSOCIATION, PORTLAND, ME

The Biomass Power Association (“BPA”) appreciates the opportunity to share its views on S. 2146, the “Clean Energy Standard Act of 2012.”

BPA represents the Nation’s grid-connected electricity industry that utilizes “open-loop” biomass-essentially agricultural and forestry by-products and residuals, as well as other organic materials-in the production of electricity and thermal energy. Most member companies have operated for decades, supporting rural economies while promoting the use of materials that would otherwise contribute to climate change if left to decay. While most members operate electricity-only facilities, others support manufacturing by providing both power and steam. All of our members make a critically important contribution to the economic fabric of rural America. We are responsible for approximately 14,000 jobs and nearly \$1 billion in value to the economy.

It has been 34 years since Congress last attempted a national energy policy with enactment of the Public Utility Regulatory Policy Act of 1978. As a Nation, we are blessed with abundant, diverse and sustainable energy resources that have the potential of contributing to our economic growth and providing long-term stability for ratepayers. For that reason, we commend Chairman Bingaman and this Committee for taking on the task of developing a national policy. The Clean Energy Standard Act of 2012 is an important and meaningful first step.

BPA supports the overall approach in the Act of requiring clean energy goals, and establishing targets that can be achieved through credits much like states currently do through state-based renewable portfolio standards. However, BPA has significant concerns with respect to the specific application of the CES to open-loop biomass. First, the Act needs to establish a simple and predictable definition of what constitutes “biomass” and embrace the view-widely shared by all state renewable portfolio standards and indeed around the world-that biomass as used by our industry today and for the foreseeable future is a carbon friendly feedstock that should be

⁷Furrey et al. 2009. Laying the Foundation for implementing a Federal Energy Efficiency Resource Standard. Washington, DC: American Council for an Energy-Efficient Economy. <http://www.aceee.org/research-report/e091>.

⁸<http://www.nwcouncil.org/energy/rtf/subcommittees/deemed.Default.asp>.

⁹<http://neep.org/emv-forum>.

promoted wherever possible. Second, we object to the Act's requirement of a regulatory proceeding to determine the carbon intensity of biomass. Finally, existing biomass facilities should qualify under the Act, and not just facilities that were built after 1991. Each of these points is discussed in greater below.

1. A Simple and Broad Definition of Biomass

At last count, there were fourteen (14) different definitions of "biomass" found in legislation enacted by the Congress since 2004, see "Biomass: Comparison of Definition in Legislation Through the 111th Congress, CRS Report to Congress March 7, 2012" there are thirty-five (35) definitions at the state level. See Exhibit A.

The definition in Section 610 (b)(5) of "Qualified Renewable Biomass" would add yet another definition—one that is vague and fraught with regulatory uncertainty. Congress should adopt the definition of "open-loop biomass" found in Section 45 of the Internal Revenue Code, or the definition of biomass found in the 2008 Farm Bill. Both are familiar to the electric generating industry, and well understood. The proposed definition in S. 2146 leaves our industry with no certainty about whether biomass will qualify, and delegates qualification of the resource—which makes up 50 percent of the Nation's renewable energy supply—to agency rulemaking.

2. The Carbon Intensity of Biomass

S. 2146 creates uncertainty regarding the carbon intensity of biomass. While there has been substantial discussion in the scientific community about how to account for carbon emissions associated with bioenergy, this much is clear—Biomass to electricity generated today and for the foreseeable future is profoundly beneficial from a carbon perspective. Current biomass feedstock sources—agricultural and urban wastes, residues, by-products and low value roundwood—do not cause land use changes or the depletion of carbon stocks. That is why all 35 states that have a renewable portfolio standard include open-loop biomass without regard to a complicated carbon intensity criteria.¹

On what scientific or policy basis should biomass be treated differently than solar or wind? Every form of energy results in the generation of some carbon emissions. Intermittent sources of renewable energy with low capacity factors need backup sources of power, and frequently that means fossil fuel-based sources like natural gas. Should the CES calculate the carbon profile of backup generation, or conduct a lifecycle analysis of solar panels or the steel in wind turbines? Congress should resist the overly complicated procedure of carbon lifecycles and simply recognize biomass as another form of "renewable energy" in Section 610 (6)(7).

In addition, the CES should create a "safe harbor" from the Clean Air Act regulation of GHG emissions for sources of energy that qualify under the CES. As others have testified, if the stated goal of the CES is to reduce carbon emissions by promoting certain electrical generation like biomass, then Congress should avoid duplicative regulation by establishing that such source is not subject to further carbon regulation by EPA.

3. Existing Versus "New" Facilities

The proposed cut-off date for what constitutes a qualifying facility—December 31, 1991—is arbitrary and would disqualify many biomass facilities in operation today. These pre-1991 plants were built without federal production tax credits and yet provide benefits like baseload capacity and improved air quality that other, intermittent sources of renewable fail to provide. If enacted, S. 2146 would have the perverse effect of causing existing facilities to close only to then promote the development of a new facility in the same place, using the same fuel source, creating the same amount of power, solely for the purpose of being eligible for the CES. Stated simply, it is in the national interest to preserve the economic viability of existing biomass while also promoting new facilities. BPA supports both and so should the Congress.

In closing, we commend the sponsors of the Bill and the Committee's attention to these important issues. As the Senate considers this legislation, we look forward to working with the Committee on the above issues.

¹The one possible exception is Massachusetts, which has proposed, through its Department of Energy Resources, a complicated and unworkable definition of biomass that is based on a flawed scientific study that focuses on the harvesting of natural forests, not the use of biomass in states with established forest products industries. See Proposed changes to Renewable Energy Portfolio Standard Regulation, 225 CMR 14.00

EXHIBIT A—STATE RENEWABLE PORTFOLIO STANDARDS BIOMASS DEFINITIONS

California

Any organic material not derived from fossil fuels, including, but not limited to, agricultural crops, agricultural wastes and residues, waste pallets, crates, dunnage, manufacturing, construction wood wastes, landscape and right-of-way tree trimmings, mill residues that result from milling lumber, rangeland maintenance residues, biosolids, sludge derived from organic matter, and wood and wood waste from timbering operations. Agricultural wastes and residues include, but are not limited to, animal wastes, remains and tallow; food wastes; recycled cooking oils; and pure vegetable oils. Landscape or right-of-way tree trimmings include all solid waste materials that result from tree or vegetation trimming or removal to establish or maintain a right-of-way on public or private land for the following purposes: 1) For the provision of public utilities, including, but not limited to, natural gas, water, electricity, and telecommunications. 2) For fuel hazard reduction resulting in fire protection and prevention. 3) For the public's recreational use.

Colorado

Nontoxic plant matter consisting of agricultural crops or their byproducts; animal wastes and products of animal wastes; methane produced at landfills or as a byproduct of the treatment of wastewater residuals.

Delaware

Organic matter that is available on a renewable or recurring basis, including timber, aquatic plants, dedicated energy crops, agricultural food and feed crop residues, forestry and timber residues, and lumber/pulp residues.

Hawaii

Including biomass crops, agricultural and animal residues and wastes, and municipal solid waste and other solid waste.

Illinois

Crops and untreated and unadulterated organic waste.

Indiana

(5) Organic waste biomass, including any of the following organic matter that is available on a renewable basis: (A) Agricultural crops. (B) Agricultural wastes and residues. (C) Wood and wood wastes, including the following (i) Wood residues (ii) Forest thinnings. (iii) Mill residue wood. (D) Animal wastes (E) Animal byproducts. (F) Aquatic plants. (G) Algae.

Iowa

Agricultural crops or residues, or woodburning facility.

Kansas

Dedicated crops grown for energy production; cellulosic agricultural residues; plant residues; methane from landfills or from wastewater treatment; clean and untreated wood products such as pallets.

Maine

Wood or wood waste, landfill gas or anaerobic digestion of agricultural products, by-products or wastes.

Maryland

Nonhazardous, organic material that is available on a renewable or recurring basis, and is: (i) waste material that is segregated from inorganic waste material and is derived from sources including: 1. except for old growth timber, any of the following forest-related resources: mill residue, except sawdust and wood shavings; precommercial soft wood thinning; slash; brush; or yard waste; 2. a pallet, crate, or dunnage; 3. agricultural and silvicultural sources, including tree crops, vineyard materials, grain, legumes, sugar, and other crop by-products or residues; or 4. gas produced from the anaerobic decomposition of animal waste or poultry waste; or (ii) a plant that is cultivated exclusively for purposes of being used at a Tier 1 renewable source or a Tier 2 renewable source to produce electricity. does not include: (i) unsegregated solid waste or postconsumer wastepaper; or (ii) an invasive exotic plant species.

Michigan

Any organic matter that is not derived from fossil fuels, that can be converted to usable fuel for the production of energy, and that replenishes over a human, not a

geological, time frame, including, but not limited to, all of the following: (i) Agricultural crops and crop wastes. (ii) Short-rotation energy crops. (iii) Herbaceous plants. (iv) Trees and wood, but only if derived from sustainably managed forests or procurement systems, as defined in section 261c of the management and budget act, 1984 PA 431, MCL 18.1261c. (v) Paper and pulp products. (vi) Precommercial wood thinning waste, brush, or yard waste. (vii) Wood wastes and residues from the processing of wood products or paper. (viii) Animal wastes. (ix) Wastewater sludge or sewage. (x) Aquatic plants. (xi) Food production and processing waste. (xii) Organic by-products from the production of biofuels.

Minnesota

Biomass includes, without limitation, landfill gas; an anaerobic digester system; the predominantly organic components of wastewater effluent, sludge, or related by-products from publicly owned treatment works, but not including incineration of wastewater sludge to produce electricity; and an energy recovery facility used to capture the heat value of mixed municipal solid waste or refuse-derived fuel from mixed municipal solid waste as a primary fuel.

Missouri

Dedicated crops grown for energy production, cellulosic agricultural residues, plant residues, methane from landfills, from agricultural operations, or from wastewater treatment, thermal depolymerization or pyrolysis for converting waste material to energy, clean and untreated wood such as pallets.

Montana

Low-emission, nontoxic biomass based on dedicated energy crops, animal wastes, or solid organic fuels from wood, forest, or field residues, except that the term does not include wood pieces that have been treated with chemical preservatives such as creosote, pentachlorophenol, or copper-chroma-arsenic.

Nevada

Biomass.

New Hampshire

Plant-derived fuel including clean and untreated wood such as brush, stumps, lumber ends and trimmings, wood pallets, bark, wood chips or pellets, shavings, sawdust and slash, agricultural crops, biogas, or liquid biofuels, but shall exclude any materials derived in whole or in part from construction and demolition debris.

New Jersey

Cultivated and harvested in a sustainable manner; same meaning as that assigned to this term in Executive Order No. 13134, published in the Federal Register on August 16, 1999. Executive Order No. 13134 defines biomass as “. . . any organic matter that is available on a renewable or recurring basis (excluding old-growth timber), including dedicated energy crops and trees, agricultural food and feed crop residues, aquatic plants, wood and wood residues, animal wastes, and other waste materials.”

New Mexico

Fuels, such as agriculture or animal waste, small diameter timber, salt cedar and other phreatophyte or woody vegetation removed from river basins or watersheds in New Mexico, landfill gas and anaerobically digested waste biomass.

New York

Agricultural Residue?Woody or herbaceous matter remaining after the harvesting of crops or the thinning or pruning of orchard trees on agricultural lands.
 Harvested Wood?Wood harvested during commercial harvesting. The supplier must have and be in compliance with a current Forest Management Plan prepared by a professional forester that includes (a) standards and guidelines for sustainable forest management that require adherence to management practices which conserve biological diversity, maintain productive capacity of forest ecosystems, maintain forest ecosystem health and vitality, and conserve and maintain soil and water resources; (b) a harvest plan following production and harvest standards based on best management practices set forth in guides developed, tested and peer reviewed for USDA and USDOE; (c) the monitoring of harvest operations by a professional forester; (d) the reporting of harvest operations by a professional forester; and (e) periodic inspections of harvesting operations by state authorities or approved non-governmental forest certification bodies to assure that harvest operations conform to the standards.

Mill Residue Wood Hogged bark, trim slabs, planer shavings, sawdust, sander dust and pulverized scraps from sawmills, millworks and secondary wood products industries.

Pallet Waste Unadulterated wood collected from portable platforms used for storing or moving cargo or freight.

Refuse Derived Fuel The source-separated, combustible, untreated and unadulterated wood portion of municipal solid waste or construction and demolition debris generally prepared by a densification process resulting in a uniformly sized, easy to handle fuel pellet or briquette.

Site Conversion Waste Wood Wood harvested when forestland is cleared for the development of buildings, roads or other improvements.

Silvicultural Waste Wood Wood harvested during timber stand improvement and other forest management activities conducted to improve the health and productivity of the forest. The supplier must have and be in compliance with a current Forest Management Plan prepared by a professional forester that includes (a) standards and guidelines for sustainable forest management that require adherence to management practices which conserve biological diversity, maintain productive capacity of forest ecosystems, maintain forest ecosystem health and vitality, and conserve and maintain soil and water resources; (b) a harvest plan following production and harvest standards based on best management practices set forth in guides developed, tested and peer reviewed for USDA and USDOE; (c) the monitoring of harvest operations by a professional forester; (d) the reporting of harvest operations by a professional forester; and (e) periodic inspections of harvesting operations by state authorities or approved non-governmental forest certification bodies to assure that harvest operations conform to the standards.

Sustainable Yield Wood (woody or herbaceous) Woody or herbaceous crops grown specifically for the purpose of being consumed as an energy feedstock (energy crops).

Urban Wood Waste The source-separated, combustible untreated and uncontaminated wood portion of municipal solid waste or construction and demolition debris. Adulterated forms of wood, such as plywood and particle board, may be used as a feedstock for biogas or liquid biofuel conversion technologies if it can be demonstrated that the technology employed would produce power with emissions comparable to that of biogas or liquid biofuel using only unadulterated sources as feedstock.

North Carolina

Agricultural waste, animal waste, wood waste, spent pulping liquors, combustible residues, combustible liquids, combustible gases, energy crops, or landfill methane.

North Dakota

Agricultural crops and agricultural wastes and residues, wood and ?wood wastes and residues, animal wastes, and landfill gas as the fuel to produce electricity.

Ohio

Solid wastes, as defined in section 3734.01 of the Revised Code, through fractionation, biological decomposition, or other process that does not principally involve combustion, biomass energy, biologically derived methane gas, or energy derived from nontreated by-products of the pulping process or wood manufacturing process, including bark, wood chips, sawdust, and lignin in spent pulping liquors.

Oregon

Organic human or animal waste; (b) Spent pulping liquor; (c) Forest or rangeland woody debris from harvesting or thinning conducted to improve forest or rangeland ecological health and to reduce uncharacteristic stand replacing wildfire risk; (d) Wood material from hardwood timber grown on land described in ORS 321.267 (3);(e) Agricultural residues;(f) Dedicated energy crops; and (g) Landfill gas or biogas produced from organic matter, wastewater, anaerobic digesters or municipal solid waste. (3) Electricity generated from the direct combustion of biomass may not be used to comply with a renewable portfolio standard if any of the biomass combusted to generate the electricity includes wood that has been treated with chemical preservatives such as creosote, pentachlorophenol or chromated copper arsenate.

Pennsylvania

(i) Organic material from a plant that is grown for the purpose of being used to produce electricity or is protected by the Federal Conservation Reserve Program (CRP) and provided further that crop production on CRP lands does not prevent achievement of the water quality protection, soil erosion prevention or wildlife enhancement purposes for which the land was primarily set aside; or (ii) any solid nonhazardous, cellulosic waste material that is segregated from other waste mate-

rials, such as waste pallets, crates and landscape or right-of-way tree trimmings or agricultural sources, including orchard tree crops, vineyards, grain, legumes, sugar and other crop by-products or residues.

Rhode Island

Fuel sources including brush, stumps, lumber ends and trimmings, wood pallets, bark, wood chips, shavings, slash and other clean wood that is not mixed with other solid wastes; agricultural waste, food and vegetative material; energy crops; landfill methane; biogas; or neat bio-diesel and other neat liquid fuels that are derived from such fuel sources.

North Dakota

Agricultural crops and agricultural wastes and residues, wood and wood wastes and residues, animal and other degradable organic wastes, municipal solid waste, or landfill gas as the fuel to produce electricity.

Texas

Biomass or biomass-based waste products, including landfill gas. A renewable energy technology does not rely on energy resources derived from fossil fuels, waste products from fossil fuels, or waste products from inorganic sources.

Utah

(iv) Except for combustion of wood that has been treated with chemical preservatives such as creosote, pentachlorophenol or chromated copper arsenate, biomass and biomass byproducts, including: (A) organic waste; (B) forest or rangeland woody debris from harvesting or thinning conducted to improve forest or rangeland ecological health and to reduce wildfire risk; (C) agricultural residue (D) dedicated energy crops; and (E) landfill gas or biogas produced from organic matter, wastewater, anaerobic digesters, or municipal solid waste.

Virginia

“Renewable energy” means energy derived from biomass, sustainable or otherwise, (the definitions of which shall be liberally construed), energy from waste, municipal solid waste.

Washington

Animal waste or solid organic fuels from wood, forest, or field residues, or dedicated energy crops that do not include (i) wood pieces that have been treated with chemical preservatives such as creosote, pentachlorophenol, or copper-chrome-arsenic; (ii) black liquor by-product from paper production; (iii) wood from old growth forests; or (iv) municipal solid waste.

West Virginia

Nonhazardous organic material that is available on a renewable or recurring basis, including pulp mill sludge.

Wisconsin

A resource that derives energy from wood or plant material or residue, biological waste, crops grown for use as a resource or landfill gases. “Biomass” does not include garbage, as defined in s. 289.01 (9), or nonvegetation-based industrial, commercial or household waste, except that “biomass” includes refuse-derived fuel used for a renewable facility that was in service before January 1, 1998.

District of Columbia

Solid, nonhazardous, cellulosic waste material that is segregated from other waste materials, and is derived from any of the following forest-related resources, with the exception of old growth timber, unsegregated solid waste, or post-consumer waste-paper: (A) Mill residue; (B) Precommercial soft wood thinning; (C) Slash; (D) Brush; (E) Yard waste; (F) A waste pallet, crate, or dunnage; (G) Agricultural sources, including tree crops, vineyard materials, grain, legumes, sugar, and other crop by-products or residues; or (H) Cofired biomass, subject to the condition under §34-1433(f).

Puerto Rico

Any organic or biological material derived from organisms that have the potential to generate electricity, such as wood, waste, and alcohol-derived fuels; and includes natural biomass, which is produced naturally without human intervention; residual biomass, which is a byproduct or residue generated in agricultural, forest, and cattle activities, as well as solid residue from the food and agriculture industry and the

wood-processing industry; for the purposes of this Act it also includes any biomass similar in nature to those described, as designated by the Administration.

Northern Marianas

Municipal solid waste, biofuels, or fuels derived from organic sources (other than coal, oil or gas).

CALPINE CORPORATION,
Washington, DC, February 29, 2012.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, U. S. Senate, Washington,
DC.

DEAR CHAIRMAN BINGAMAN:

Calpine is a national leader in clean power generation, providing nearly 28,000 megawatts of electricity generated from the largest and most modern fleet of low-carbon, combined-cycle natural gas-fired power plants, and from the largest source of renewable geothermal power. We have been a leader in supporting responsible environmental legislation and regulations at the state, regional, and national levels. We also have been and continue to be committed to generating electricity from the cleaner, more efficient energy resources.

With respect to your proposed Clean Energy Standard Act of 2012 (“CES”), Calpine believes that, if a CES is needed to assist in moving the nation towards a cleaner energy economy, it must employ specific mechanisms in order to deliver meaningful benefits and meet its stated goals. First, it should be defined sufficiently broadly to encompass all low GHG emissions resources, including efficient natural-gas fired power plants and combined heat and power plants. It must set reasonable interim targets and timetables to provide incentives for early and steady investments in existing and new clean energy resources. Cost control mechanisms, such as alternative compliance payments (ACP) and banking, should be included to lessen the economic impact on regulated entities and consumers. Additionally, when setting the price levels for the ACP and CES credits, they should be set at a level sufficiently high enough to send a clear price signal to ensure regulated entities make needed investments in new, clean technologies. The Clean Energy Standard Act of 2012 addresses much of these criteria and marks a good framework for discussion should such legislation move forward.

We look forward to working with you as the discussion of this CES legislation progresses.

Sincerely,

YVONNE A. MCINTYRE,
Vice President, Federal Legislative Affairs.

STATEMENT OF THE PROVINCE OF MANITOBA

We are pleased to have the opportunity to submit this statement for the record in connection with this hearing on S. 2146. We applaud the Committee’s efforts to promote a clean energy future. However, we have a significant concern about the legislation as drafted because it does not recognize Canadian hydropower consumed in the U.S. as an eligible “clean energy” source. For the reasons stated below, we respectfully urge the Committee to reconsider this aspect of the legislation.

This statement addresses (1) the important role that Canadian hydropower plays in the U.S.; (2) how Canadian hydropower supports the development of U.S. renewables; (3) the recognition by several U.S. states of Canadian hydropower as a renewable resource; (4) Canada’s strong commitment to clean electricity; (5) the close alignment of the U.S. and Canada’s electricity futures; and (6) the substantial untapped hydropower potential in Canada that can help the U.S. meet its clean energy objectives.

The important role that Canadian hydropower plays in the U.S.

On an annual basis, Canada exports approximately 50 TWh of electricity to the U.S. The vast majority of that power (~80 percent) is from hydropower. These exports to the U.S. represent 10 percent of the hydro currently consumed in the U.S., equivalent to powering 3.5 million U.S. homes. Over the past 20 years, the electricity imports from just one province (Manitoba) have resulted in the avoidance of over 170 million metric tons of greenhouse gas emissions. In 2011 alone, provincial power utility Hydro-Québec’s net electricity exports helped avoid 12 million metric tons of CO₂ emissions, the equivalent of yearly emissions of 3 million vehicles.

In some Border States, Canadian imports provide an important portion of the electricity necessary to meet the state's needs. For example, Manitoba typically provides the Upper Midwest with about 10,000 GWh of electricity per year. This is enough to power nearly 1 million homes, and accounts for over 30 percent of the region's supply of renewable generation. Manitoba Hydro currently delivers electricity into Minnesota that is approximately equivalent to 11 percent of the state's total electricity demand. In Vermont, the portion is even higher, with one-third of the electricity consumed in the state delivered from Québec. New York receives about 7 percent of its electricity from Canada.

The chart below shows the degree to which some of the Border States, and the U.S. as a whole, rely upon Canadian power sources:

Consumption of Canadian electricity is not just limited to Border States. By virtue of its ties through the Western Interconnection grid, Canada provided over 2,250 GWh of electricity to California in 2010—enough electricity to power about 320,000 California homes (estimate based on 2010 Energy Information Administration data). As transmission infrastructure continues to develop and Canada increases its hydro-power infrastructure, the potential for this sort of longer-range relationship increases.

Canadian hydropower helps support U.S. renewable development

In many Border States that rely on Canadian hydropower, the availability of this low-cost, clean electricity helps to support the development of the states' own intermittent renewable energy sources (e.g., wind, solar). Canadian hydropower provides a clean, reliable and affordable source of electricity that is available to meet states' needs and to support the variability of intermittent resources.

An increasing number of U.S. utility partners and states that border Canada are recognizing Canadian hydropower as part of their Renewable Energy Portfolio standards and climate risk strategies. The recently completed sale between Minnesota Power and Manitoba Hydro is a good example of this. The agreement also includes a 'U.S. wind storage' provision that highlights the synergies between those resources.¹ In the Northeast, the long-term (2012-2038) contract between H.Q. Energy Services (U.S.), a subsidiary of Hydro-Québec, and Vermont's distribution utilities is a key component of Vermont's strategy to remain the lowest per-capita emitter of greenhouse gases (GHGs) among U.S. states. Including Canadian hydro in Clean Energy Standard (CES) legislation would respect historic partnerships between the U.S. and Canada and would enable these types of sustainable development partnerships to grow.

As Jon Brekke, Vice President of Minnesota's Great River Energy, stated in 2009 in an interview with Manitoba Hydro:

We have over 300 megawatts of wind now in operation and as our consumers demands increase during the typical day there's no guarantee that the wind power's going to be there to match that. We also have a problem where sometimes we get too much energy from wind and the demand of our members is not there to absorb all that wind energy. Manitoba Hydro can take advantage of that low cost power and store up water resources during those hours. Then, when loads increase, hydroelectric power can be released to help provide power to the consumers in the region.

Moreover, recognition of Canadian hydropower as a qualifying clean energy resource in a U.S. national CES would not displace or adversely affect the development of other clean energy sources in the U.S., such as wind or solar power. The Energy Information Administration shows that low- or no-carbon sources generated 31 percent of U.S. total electricity in 2009 (20 percent nuclear, 7 percent hydroelectric, and 4 percent other renewables).² S. 2146 would require 84 percent of electricity sold to come from low- or no-carbon energy sources by 2035. Given the size of that gap, there is an enormous U.S. opportunity for the development of clean energy technologies. In fact, considering the magnitude of the challenge, very high levels of development would be required from many clean energy technologies including Canadian hydropower.

* Chart has been retained in committee files.

¹Minnesota Power Press Release, May 24, 2011: Hydropower purchase agreement will trim carbon emissions, bolster transmission system and allow Minnesota Power to "store" wind energy: http://www.mnpower.com/news/articles/2011/20110524___NewsRelease.pdf.

²U.S. Energy Information Administration, Analysis of Impacts of a Clean Energy Standard as requested by Chairman Bingaman, November 2011; http://www.eia.gov/analysis/requests/ces___bingaman/pdf/ces___bingaman.pdf.

At present, Canadian imports account for less than 1 percent of overall U.S. electricity consumption—a minimal amount, in the context of overall U.S. electricity generation and consumption. Even if this figure were augmented by the development of additional Canadian hydropower capacity, Canadian hydro exports to the U.S. will still account for a very small overall percentage of U.S. consumption.

Furthermore, any significant Canadian hydro development could only take place gradually and over a long period of time due to multiple constraints on construction resources, labor, engineering and capital. In general, it takes 8-14 years for consultation, planning, permitting, and construction of a hydro generating station compared to 3-5 years for a thermal generating station. Thus, for the foreseeable future, there will be ample room for as much development of U.S. renewable resources as the market will accommodate.

However, if the CES legislation excludes Canadian hydropower, it could actually send a perverse signal to current American buyers to increase use and reliance on more carbon-intensive or otherwise riskier sources of energy, potentially stunting emerging plans for further growth of new hydropower into U.S. markets and moving the U.S. further away from the goal of reducing GHGs. As Minnesota Power notes in its testimony before this Committee, if S. 2146 does not qualify Canadian hydro as a clean energy source, Minnesota Power would be compelled to develop thermal power alternatives to supply the baseload necessary to support its wind power development. This would result in an additional annual 560,000 metric tons of greenhouse gas emissions in Minnesota.

States are recognizing Canadian hydropower as a renewable resource

In recent years, there has been a trend toward recognizing Canadian hydroelectricity imports as qualifying under state Renewable Portfolio Standards (RPS). Here are examples of developments that have taken place over the past two years at the state level:

- In 2010, the Vermont legislature amended its renewable requirements, granting full recognition of all hydroelectricity as renewable, including that imported from Québec, Canada.
- In July 2011, Wisconsin adopted energy legislation that grants renewable credit to imports from new hydropower facilities under development in Manitoba, Canada.
- In March 2011, Minnesota's Public Utilities Commission ruled that Minnesota Power could apply a portion of hydroelectricity purchased from Manitoba Hydro to meet state RES requirements.
- In April 2011, California adopted legislation that requires the California Energy Commission to conduct a study (due June 30, 2012) to determine whether British Columbia's run-of-river hydroelectric generating facilities should be included as eligible resources for its Renewable Energy Resources Program.

S. 2146 evidences an intention not to impede state Renewable Portfolio Standards laws. However, by excluding Canadian hydropower, the legislation creates an inconsistency with many state RPS standards. If this is not addressed, it could nullify and effectively preempt the affected state standards.

In addition, utilities located in U.S. Border States would face a conflicting patchwork of state and federal regulatory requirements if federal and state clean energy requirements and incentives are not properly aligned. The National Association of Utility Regulators (NARUC) has recognized this. In 2010, the Association adopted a resolution recognizing all North American hydropower as a renewable energy resource that warrants consideration in regional and national clean energy mandates.

Canada has strongly committed itself to a clean electricity mix

Canada's generation mix is already quite clean—about 60 percent of the electricity produced in Canada each year is renewable and 15 percent is nuclear—giving Canada already one of the cleanest generation mixes in the world. Canada is undertaking steps to make its generation mix even cleaner. Policies to further this effort are being adopted at both the federal and provincial levels in Canada.

The Government of Canada is working towards phasing out conventional coal-fired generation through regulations expected to be finalized in 2012. The regulation would essentially prohibit the construction of new coal-based plants after 2015 unless they include carbon capture and storage (CCS) equipment. These regulations would also require companies to close plants after 45 years of operation—unless they are retrofitted with CCS. Approximately two-thirds of Canada's coal-fired plants will reach the end of their forty-fifth anniversary by 2025, and more than 80 percent will do so by 2030.

The pie charts* below illustrate the extent to which Canadian electricity is produced from clean sources relative to the rest of the world.

In addition to federal regulations, many Canadian provinces have regulations in place to reduce GHG emissions. Some examples include:

- British Columbia implemented a carbon tax in 2008 that will increase to CAD \$30 per metric ton CO₂-equivalent in July 2012 and covers about 75 percent of the province's GHG inventory. In addition, British Columbia has a legislated target to generate at least 93 percent of the electricity in British Columbia from clean or renewable resources. As well, B.C. energy policy states that existing thermal generation must have net zero greenhouse gas emissions by 2016, as must any new facilities.
- Manitoba has implemented an emissions tax on coal, and the last remaining coal-fired facility is regulated to operate only in support of emergency situations.
- Ontario is in the process of phasing out all of its coal-fired capacity (over 6000 MW) by 2015.
- In 2012, Québec started an emissions trading program in conjunction with the Western Climate Initiative that will initially cover, as of January 1, 2013, approximately 75 emitters with annual emissions of 25,000 metric tons CO₂ equivalent or above. Currently, 97 percent of Québec's electricity production comes from hydropower. Québec is committed to meeting its medium-term GHG emissions reduction target (20 percent below 1990 levels by 2020).

In Canada, hydropower facilities are subject to stringent requirements of both the Canadian federal government and provincial governments. Every hydropower project is subject to a detailed assessment of the impacts of the project on the environment and extensive public consultations, including consultations of the aboriginal communities. Canada's constitution (s.35) imposes additional requirements regarding the consultation of any aboriginal community that may be impacted before the government's decision.

Under federal law, all hydropower projects must also meet the requirements of the Fisheries Act, those of the Species at Risk Act (SARA), those of the Migratory Birds Convention Act and those of the Navigable Waters Protection Act. The Fisheries Act ensures that fish populations and migrations are maintained and that losses of fish habitat are mitigated or compensated.

Under provincial law, using the Province of Manitoba as an example, approvals contain detailed restrictions on the design and construction of the facility. They also require mitigation of habitat implications and strict oversight of downstream sediment. Extensive collaboration with native First Nations helps to ensure that the effects of projects on local populations are minimized. As a result, hydropower facilities now under development in Manitoba will rank among the world's most environmentally protective. For example:

- The 200-megawatt Wuskwatim Generating Station under construction in northern Manitoba has been designed as a low head, "run-of-river" plant. The facility will generate less than 0.2 sq. miles of flooding, minimizing land-use change implications due to flooding and other environmental impacts. Wuskwatim is being developed by an equity partnership between Nisichawayasihk Cree Nation and Manitoba Hydro, and represents the first equity partnership with a First Nations community on a major generating station project.
- The 1485-megawatt Conawapa Generating Station in Manitoba has been designed to take advantage of the naturally steep river banks of the Nelson River, which are over 160 feet high, in order to limit flooding to approximately 1.9 sq. miles, almost all within the river's banks, again minimizing potential negative environmental impacts. The provincial government and Manitoba Hydro have entered into a Memorandum of Understanding with Fox Lake Cree Nation related to the Conawapa project.

A levelized lifecycle GHG comparison for generating one GWh of electricity at the Wuskwatim hydropower facility was produced to compare various conventional and renewable power generation options. The results show that relative life cycle GHG emissions of the Wuskwatim project are very small and insignificant relative to those of conventional thermal generating stations and comparable to that of wind. Life cycle assessments underway for Conawapa (1485-megawatt) and Keeyask (695-megawatt) generating stations are expected to show similar results.

*Pie charts have been retained in committee files.

In the Northeast, the Province of Québec applies ISO-14001 standards to the development of its hydropower projects, with special attention to mitigation and adaptation efforts and community outreach. In fact, since the 2002 Peace of the Brave Agreement with the Cree nation, the negotiation of agreements with aboriginal communities has been a key component of Québec's approach to hydropower development.

Long-term environmental follow-up on projects is performed to measure the real impact of projects and the effectiveness of the mitigation and compensation measures. Recent projects provide examples on the benefits of ensuring adequate long-term monitoring of impacts:

- On Québec's North Shore, construction of the Romaine river complex, an interconnected network of 4 power stations that will generate 1,550 MW, began in 2009, following completion of an extensive environmental impact assessment that lasted 4 years. In 2011, 50 percent of the person-years that were created on the Romaine project (1,198) benefitted Cote Nord and Innu workers. Environmental follow-up on the Romaine river complex project will continue until 2040, allowing Hydro-Québec to monitor environmental changes, determine the effectiveness of mitigation and compensation measures, and make any necessary adjustments. ISO 14001-certified environmental management systems and OHSAS 18001-certified health and safety managements systems govern job-site activities.
- The Pribonka River project, in Québec's Saguenay-Lac-St-Jean region, came on-line in 2008 and is the focus of sustained environmental conservation efforts by Hydro-Québec, so as to preserve the river's rich fauna. Since 2007, the project's reservoir has been stocked with 315,000 juvenile lake trout. Waterfowl breeding has increased and the reservoir is frequented by twice as many waterfowl broods as in 2008.

U.S. and Canada's electricity futures are closely intertwined and aligned

Canada plays a very important role in the overall energy security of the U.S. The two countries are each others' largest trading partners. Canada now supplies 9 percent of overall U.S. energy needs, including 87 percent of its natural gas imports, 21 percent of its crude oil imports, and one-third of the uranium used in U.S. nuclear power plants. Canada plays a key role in helping the U.S. reduce its dependence upon energy from unstable and unreliable overseas sources.

Moreover, the electrical grids of the U.S. and Canada are highly interconnected. Indeed, they are more accurately thought of as a single North American electrical grid, composed of over 200,000 miles of high-voltage transmission lines. In 2009, the total amount of electricity that flowed across the U.S.-Canada border through this system of power lines—from Canada to the U.S. and vice-versa—exceeded 70,000 GWh.

The map below shows the extent of U.S.-Canadian electrical integration (only the high voltage interconnections are shown).

As the map shows, increased cross-border electricity flow will require construction of new transmission infrastructure, which drives jobs in design, engineering, construction and production of materials on both sides of the Canada-U.S. border. A recent study by Brattle Consultants estimated that, for every \$1 billion invested in U.S. transmission infrastructure, \$2.4 billion in economic output and 13,000 equivalent years of employment are generated.

Demand for Canadian hydropower helps to promote further development of Canadian hydropower infrastructure, and this provides benefits to U.S. manufacturers that supply goods and services to help build out the Canadian infrastructure. It should also be noted that, because our economies are so entwined, for every dollar spent in Canada on energy, the U.S. receives 91 cents back in the form of revenue from exports to Canada. In all cases, furthering reliance on North American energy resources helps minimize leakage of investment out of the economy and protects U.S. jobs.

In February 2009, shortly after taking office, President Obama met with Canadian Prime Minister Harper and established the U.S.-Canada Clean Energy Dialogue (CED), which committed both nations to move toward a cleaner, more secure energy future. When the two leaders met again in February 2011, they issued a joint statement incorporating the "Beyond the Border" policy. The statement stressed the close interconnection between the two countries on national security and energy policy.

To further the shared energy goals of the U.S. and Canada, the CED has committed to "increasing opportunities for trade in clean electricity." This commitment was motivated by an acknowledgment that "[t]he North American electricity market is integrated across national borders." Canadian hydropower, which accounts for over 60 percent of Canadian electrical generation, is a clean and stable resource

that can play a central role in realizing the shared clean energy goals. It can help displace electrical generation from fossil fuels in the U.S., thereby helping the U.S. reduce emissions.

Canada has substantial untapped hydropower potential that can help the U.S. meet its clean energy objectives

Canada still has a large untapped hydropower potential. Hydropower projects are capital-intensive to build and relatively low-cost to operate. A recent report by the Canadian Hydropower Association cited costs per MW installed from \$2.9 million/MW to CAD \$4.44 million/MW depending on the region in which the generation is built.³

In addition to the capital costs, building cross-border transmission capacity presents additional challenges. In general it takes 8-14 years for consultation, planning, permitting, and construction of a hydro generating station compared to 3-5 years for a thermal generating station.

Given the high capital costs and long lead times associated with new hydropower development in Canada, if the U.S. adopts a CES that does not recognize Canadian hydropower as a qualified clean energy resource, the U.S. will be disincentivizing U.S. utilities from purchasing Canadian hydropower to the detriment of U.S. ratepayers that have been benefiting from this clean and costs effective energy resource.

Current plans to purchase (and therefore to develop) hydropower in Canada depend to an extent on the ability of hydropower to help the buyer manage GHG and other environmental price risks. If passed, S. 2146 would effectively be the major GHG management policy in the United States (alongside EPA regulatory actions under the Clean Air Act). Unfortunately, under the current bill, Canadian hydro would be treated the same as high-emitting GHG intensive coal and less favorably than medium-emitting natural gas. This means U.S. purchasers will see little of the risk management value they have been counting on from this clean renewable resource.

The total technical potential of 163 GW in Canada as illustrated in the *map below is more than double the capacity currently in service.⁴ About 25 GW of that capacity is currently accounted for in various stages of project planning across Canada. (Construction is underway or expected to begin within the next ten years on 13 GW. The additional 12 GW could be developed if the appropriate circumstances arise.)

Conclusion

We are committed to working with the U.S. on the shared goal of moving towards a cleaner, more secure electricity future. While we strongly support the Committee's objectives in this legislation, we believe that the treatment of Canadian hydropower in S.2146 would frustrate these objectives. We respectfully urge the Committee to revise the bill to enhance the ability of U.S. utilities to utilize Canadian hydropower to meet clean energy goals in a cost effective manner.

We thank you for the opportunity to submit this testimony and look forward to working with you to achieve these important goals.

COVANTA ENERGY,
Morristown, NJ, February 29, 2012.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, U.S. Senate.

DEAR MR. CHAIRMAN: Covanta Energy congratulates you on the introduction of your clean energy standard legislation. It is widely acknowledged that you have worked for years to create a renewable energy standard, and that your leadership and dedication have not only advanced the energy and environment debate in Washington, but have also helped create state renewable policy across the country. Your legislation sets the stage for our country to lessen our dependence on fossil fuels and increase the creation of good-paying, long-term jobs in the clean energy sector.

³ Job Creation and Economic Development Opportunities in the Canadian Hydropower Market; HEC Montreal report for the Canadian Hydropower Association, 2011.

*Map has been retained in committee files.

⁴ Study of the Hydropower Potential in Canada: Final Report. Canadian Hydropower Association, 2006.

We look forward to doing our part in helping our nation fulfill its potential by creating energy from waste and moving away from burying valuable BTUs in landfills. Thank you for your continued leadership in setting America's energy policy.

Sincerely,

PAULA SOOS,
Vice President, Government Relations.

GAMESA TECHNOLOGY CORPORATION,
Trevoose, PA, May 10, 2012.

Hon. JEFF BINGAMAN,
U.S. Senate Energy & Natural Resources Committee, Washington, DC.

DEAR CHAIRMAN BINGAMAN:

Thank you for this opportunity to submit written testimony in connection with the above-referenced hearing.

With more than 17 years' experience, Gamesa is a world leader in the design, manufacture, installation and maintenance of wind turbines, with more than 24,000 MW installed in 35 countries on four continents and over 16,000 MW under maintenance. The company has 34 production facilities in Europe, the US, China, Brazil, and India and over 8,000 employees worldwide.

Gamesa is also a world leader in the development, construction and sale of wind farms, having installed over 4,100 MW and having a portfolio of more than 23,800 MW in Europe, America and Asia. The annual equivalent of the 24,000 MW installed amounts to more than 5.4 million tons of petroleum (TEP) per year and prevents the emission into the atmosphere of about 21 million tons of CO₂ per year.

In our responses to the Bingaman-Murkowski White Paper, Gamesa stated that the goal of a national Clean Energy Standard (CES) should be to drive the domestic market for clean (zero-emissions) energy technologies that will reduce greenhouse gas emissions from electric generators. In those responses, Gamesa identified several core principles that should guide any bill designed to accomplish that goal.

We at Gamesa are impressed by how The Clean Energy Standard Act of 2012, S. 2146, addresses these principles, and with small changes, Gamesa would wholeheartedly support the bill. Let me explain why the bill so closely follows the principles we outlined in the White Paper, and what small changes we would recommend.

Include as many utilities as possible to affect the largest market. The bill exempts small electricity retailers that sell fewer than 2 million megawatt hours of electricity in 2015, and then ratchets the exemption down to 1 million megawatt hours by 2025.

Focus solely on electricity generation and not energy efficiency. The bill does precisely this.

Adopt gradually increasing targets over successive 5-year periods to ensure markets can react and grow quickly. The bill exceeds the expectations implicit in this principle by increasing the targeted percentages of clean electricity every single year, going from 24 percent in 2015 to 84 percent by 2035.

Set target percentages at levels that ensure at least 30 percent compound annual growth in deployment for the wind industry annually for the next five years, and then 20 percent compound annual growth in deployment over the subsequent five-year period. According to the Energy Information Agency's (EIA) modeling of the bill, the amount of wind energy purchased by utilities increases from 95 terawatt hours in 2010 to 212 terawatt hours by 2025—an overall increase of 223 percent, representing a compound annual growth rate of 5.5 percent.

Allocate credits to only clean (zero-emissions) energy sources; and if partial credits are offered for non-clean energy sources, those credits should ratchet down over time. The bill does give partial credits to energy sources that are responsible for some carbon emissions, but their credits are calculated in a reasonable manner. The credits do not ratchet down over time, but it appears that the higher percentage targets provided in the bill make these partial credits less valuable to utilities as they strive to meet the higher percentage targets in the later years.

If partial credits are awarded, establish tiers to incentivize the development of non-emitting energies and avoiding a monopoly of conventional emitting technologies. The EIA modeling seems to indicate that the aggressive target percentage increases over time avoids the monopoly of conventional emitting technologies that we feared.

Measure emissions in the production and extraction process of the fuel source. The bill measures emissions only from the generation source of electricity. Gamesa's concern here is that there are fuel sources tapped for the production of electricity

where the greenhouse gas emissions could be significant at the extraction (or distribution) stages, and those emissions should be accounted for in calculating credits under the bill.

It seems to Gamesa that the bill attempts to address this question to some extent in section 611. That section requires a study of the “losses of natural gas” that occur during the “production and transportation” of natural gas, and it requires the Secretary to make policy recommendations based on the results of the study. But we believe the scope of this section should be expanded in two ways.

First, it should require that the study should be explicit about including the tracking of the methane component of natural gas emissions at these stages. And second, the language should require the Secretary to make specific policy recommendations as to what credit calculations under section 610(g) of the bill should be modified in accordance with the findings of the study.

Other policies will also be required to achieve the full set of goals set by a national CES—namely transmission upgrades, permitting acceleration, and ensuring the long-term viability of financial capacity to drive the market growth. Gamesa believes that the passage of the Clean Energy Standard Act of 2012 will expand the U.S. market for clean energy technologies, drive down the costs of clean energy technologies over a relatively short period of time, and give millions of Americans access to clean, and affordable electricity. In so doing, our strong belief is that a CES of this scope will spur economic growth, significant greenhouse gas emissions reductions, and robust American job creation.

Sincerely,

DAVID FLITTERMAN,
Chairman.

GE ENERGY,
Washington, DC, March 1, 2012.

Hon. JEFF BINGAMAN,
Chairman, Senate Energy and Natural Resources, Committee, 304 Dirksen Senate Office Building, Washington, DC.

DEAR MR. CHAIRMAN:

Thank you for contacting us to make us aware of the new clean energy standard (CES) legislation that you plan to introduce later today.

GE is supportive of the legislation and looks forward to working with you and members of the committee on this important proposal. We believe that federal energy policy should support an aggressive and predictable transition to a diverse portfolio of clean energy technologies, including wind and solar power, highly flexible and efficient natural gas generation, waste heat-to-electricity, advanced nuclear energy and next generation coal power with carbon capture, utilization and storage. By our reading, your legislation does provide such a transition to a diverse portfolio of clean energy technologies.

We applaud you and your co-sponsors on this important first step toward creating a clean energy standard and improving our nation’s energy future.

Sincerely,

ROBERT HALL III,
Senior Manager & Counsel GE Energy.

STATEMENT OF DOUGLAS A. DOUGHERTY, PRESIDENT AND CEO, THE GEOTHERMAL EXCHANGE ORGANIZATION

On behalf of the Geothermal Exchange Organization (GEO), a non-profit trade association representing the U.S. geothermal heat pump industry, we are pleased to submit a statement for the record on S. 2146, the Clean Energy Standard Act of 2012.

GEO strongly supports the goals of S. 2146 but would like to work with the Committee to ensure that utilities receive credit under the CES for the renewable energy that geothermal heat pumps harness from the ground.

Geothermal heat pumps capture a distributed, thermal form of renewable energy that can be measured, metered, and verified and effectively address one of the biggest consumers of U.S. energy—buildings. Buildings account for more than 70 percent of the nation’s electricity usage, and geothermal heat pumps have the potential to reduce energy use by as much as 40-70 percent in a typical building.

Geothermal heat pumps are a 50 state technology that use the only renewable energy resource that is available on demand at the point of use and cannot be de-

pleted. If included in the CES, every utility in the country can promote geothermal heat pumps as way to meet its CES obligation.

Ensuring that utilities get credit under a CES for the thermal energy avoided by geothermal heat pumps will create an incentive for utilities to actively promote this proven technology. Every electric utility in the country can improve its load factor, mitigate the need for price increases, lessen the strain on the transmission grid, forestall future generation needs, reduce carbon emissions, and provide consumers with improved conditioned space by promoting geothermal heat pumps. In fact, a review of existing studies done by DOE labs suggests that GHPs could avoid more than 130 billion kWhs of retail electricity sales by 2035.

While GEO appreciates that S. 2146 does direct the Department of Energy to conduct a study to examine the benefits and challenges of including geothermal heat pumps in the CES, GEO does not believe we should wait for up to three years for a study when the benefits of installing geothermal heat pumps are well documented.

In addition, measurement and verification of the GHP contribution can be accomplished in a relatively straightforward manner. The Department of Energy and the national labs already have identified ways to measure and verify the thermal energy savings. Alternatively, measurement could be achieved by requiring the installation of a relatively inexpensive meter to measure the renewable energy geothermal heat pumps harness from the ground.

The Committee could also look to legislation recently signed into law in Maryland as a model. The Maryland legislature recently passed legislation to make geothermal heat pumps eligible for renewable energy credits under the state's Renewable Portfolio Standard (RPS). The state recognized that including geothermal heat pumps will help the state meet its RPS goal, while at the same time helping utilities reduce peak demand, stimulating the economy by increasing geothermal heat pump installations, helping consumers cut energy costs, and reducing carbon emissions.

Under the Maryland model, the thermal energy avoided by installing geothermal heat pumps in the residential setting will be estimated using modeling tools. For commercial installations, a meter would be installed on site to measure the thermal energy saved. In both cases, the BTU energy savings attributable to geothermal heat pumps are converted into annual megawatt hours that utilities can claim for credit under the Maryland RPS.

In summary, we strongly support legislation to establish a CES and hope to work with Chairman Bingaman and the members of the Committee to ensure that geothermal heat pumps are included and utilities can claim credit for the renewable energy that geothermal heat pumps harness from the ground.

Thank you again for the opportunity to submit testimony for the hearing record.

HYDRO GREEN ENERGY,
Westmont, IL, March 2, 2012.

Hon. JEFF BINGAMAN,
Chairman, Energy and Natural Resources Committee, U.S. Senate, 304 Dirksen Senate Building, Washington, DC.

DEAR CHAIRMAN BINGAMAN:

On behalf of Hydro Green Energy, I am writing to express our support for S. 2146, the Clean Energy Standard Act of 2012.

Hydro Green Energy (HGE) is a renewable energy development company with proprietary hydropower technology. The company, which maintains headquarters in Illinois, focuses on developing new hydropower generation at existing, non-powered dams in an environmentally-responsible manner.

HGE is currently developing 37 low-impact hydropower projects in 15 states with a total installed capacity of 350 MW. Our projects will provide enough annual power for nearly 200,000 homes and annually avoid 2.7 billion pounds of carbon emissions.

Based on our reading of S. 2146, as well as conversations with your staff, we understand that S. 2146 would qualify all of our projects and our energy output as "clean," allowing for full participation in the Clean Energy Standard (CES). Federal policies such as the CES will ensure the most robust, economic development of America's renewable energy resources.

While hydropower is the nation's largest renewable resource, and it has long played an important role in providing millions of Americans with clean, reliable and predictable power, there is substantial growth potential for new, environmentally-responsible hydropower. S. 2146 properly recognizes hydropower's critical role in meeting the goals of S. 2146, as well as its ability to robustly contribute to America's clean energy economy.

We look forward to working with you and your colleagues in the Senate to see that S. 2146's recognition of hydropower remains unchanged and that the Clean Energy Standard Act of 2012 is enacted into law.

If you or your staff have any questions, please do not hesitate to contact Mark R. Stover, Hydro Green Energy's Vice President of Corporate Affairs.

Sincerely,

MICHAEL P. MALEY,
President & CEO.

IBERDROLA RENEWABLES,
Portland, OR, March 1, 2012.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN:

I am writing on behalf of Iberdrola Renewables to commend you for introducing the Clean Energy Standard Act of 2012. As one of the leading independent electricity generators and marketers in the United States, Iberdrola Renewables believes that a properly structured Clean Energy Standard is an essential element of a national energy policy that enhances our energy security, promotes fuel diversity, protects consumers from energy price volatility and substantially reduces greenhouse gas emissions.

A national Clean Energy Standard offers a cost-effective approach to provide electric generating facilities utilizing clean energy resources an opportunity to compete in the marketplace. Over the last decade, the ability of renewable energy generators to attract customers has depended, in part, on the availability of a tax credit that has been scheduled to expire practically every other year. This has created several "boom and bust" cycles in the industry. A Clean Energy Standard, on the other hand, provides generators utilizing renewable and other clean resources, a more stable, long-term environment within which to plan and operate.

Your introduction of the Clean Energy Standard Act of 2012 is an important first-step in the process of getting a national Clean Energy Standard enacted. The bill proposes to establish aggressive, but achievable targets for utilities to diversify their resource portfolio. Iberdrola Resources offers any assistance necessary to help you get a meaningful National Clean Energy Standard enacted this year.

I also want to take this opportunity to thank you for the vision and leadership you have demonstrated during your service in the United States Senate. You have been on the forefront of every major piece of legislation that has impacted the renewable energy industry over the last 30 years. I hope that you will be able to complete your career with the enactment of a strong national Clean Energy Standard.

Sincerely,

MARTIN MUGICA,
Executive Vice President.

INTERNATIONAL DISTRICT ENERGY ASSOCIATION,
Westborough, MA, March 9, 2012.

Hon. CHAIRMAN BINGAMAN:

The International District Energy Association (IDEA) applauds you for your leadership in introducing the Clean Energy Standard Act of 2012. This legislation would provide a strong market-based approach to encouraging clean energy that can spur economic growth, increase energy security and grid reliability, and reduce emissions. Implementation of the CES would be particularly timely given the upcoming need for replacement of retiring coal power plants.

We are extremely pleased that the bill recognizes the efficiency and economic advantages of combined heat and power (CHP) and district energy systems. Few people realize that two thirds of U.S. power generation fuel energy is currently thrown away as waste heat. Increased implementation of more CHP—which generates electricity while recovering useful thermal energy for heating buildings or industrial processes—will increase energy efficiency, reduce emissions, reduce power transmission constraints and losses, and strengthen power grid reliability and energy security.

Secretary Chu, in his February 16 testimony to the Senate Energy and Natural Resources Committee, described his February 2 visit to IDEA member Thermal Energy Corporation (TECO) in Houston, TX which employs highly efficient CHP and

district energy systems to supply steam for heating and chilled water for cooling to the Texas Medical Center, the largest medical center in the world. Secretary Chu described DOE as “bullish on CHP” and cited district energy systems as a primary near term market opportunity to achieve dramatic increases in energy efficiency on a community scale.

District energy systems like TECO produce steam, hot water and chilled water at a central plant for distribution through underground piping networks in cities, campuses and communities to multiple buildings for space heating, hot water and air conditioning. District energy systems not only represent an enormous “heat sink” for increased CHP capacity. As the CES bill recognizes, district energy systems also reduce power loads by delivering thermal energy to consumers who would otherwise draw power from the grid. This is welcome recognition of the importance of heating and cooling, which consumes 31 percent of total primary energy use in the U.S.

In contrast to some of the other potential clean energy resources, CHP and district energy are proven technologies that can dramatically increase the fuel efficiency of the electricity sector with the simultaneous production of useful thermal energy and power nearer to end users. CHP systems can reach efficiencies above eighty percent. Oak Ridge National Laboratory estimated in 2008 that increasing the percentage of electricity generated by combined heat and power in the US from 85 GW of capacity (9 percent) to 241 GW (20 percent) by 2030 would attract \$234 billion in private investment, produce 5.3 www.districtenergy.org quads of annual fuel savings, create nearly 1 million new jobs and cut CO₂ emissions equivalent to taking 154 million cars off the road.

IDEA (www.districtenergy.org) serves as a vital information hub for the district energy and combined heat and power industries, connecting industry professionals and advancing the technology around the world. With headquarters just outside of Boston, Mass., the 1,500-member IDEA was founded in 1909 and comprises district heating and cooling system executives, managers, engineers, consultants and equipment suppliers from 25 countries. IDEA supports the growth and utilization of district energy as a means to conserve fuel and increase energy efficiency to improve the global environment.

IDEA looks forward to working with members of Congress and the Administration on the optimization of district energy/CHP as an important clean energy strategy for our country.

Sincerely,

ROBERT P. THORNTON,
President & CEO.

STATEMENT OF DAVID J. MCMILLAN, EXECUTIVE VICE PRESIDENT, FOR MINNESOTA POWER, DULUTH, MN

Minnesota Power (MP) has reviewed the Clean Energy Standard Act of 2012 and related Energy Information Administration (EIA) analysis. MP believes that compared to cap-and-trade programs a Clean Energy Standard (CES) offers several advantages and is a superior policy to achieve utility-sector greenhouse gas (GHG) emission reductions. We offer these comments aimed at increasing the amount of clean energy that electric utilities provide their customers, reducing greenhouse gas emissions, and accomplishing both in a cost-effective manner.

Minnesota Power's General Comments on S. 2146, the Clean Energy Standard Act of 2012

A fundamental question raised by the legislation is “what is the specific policy objective that is intended to be addressed?” The purpose section contains three separate and in some cases competing directives: stimulating clean energy innovation; promoting low and zero carbon electric generation in the United States, and; doing this at the lowest incremental cost to consumers. In Minnesota Power’s view, the bill fails to balance the three directives to achieve both effectiveness and affordability.

If the bill’s objective is to maximize the reduction of GHG emissions, all utilities, including co-operative and municipal utilities of any size, should be subject to the same standards. If the bill is not comprehensive it will not maximize CO₂ emission reductions and will create competitive dislocations. The United States cannot begin to address what is an international issue if the starting off spot for a domestic GHG reduction program isn’t comprehensive in nature.

Again, if the objective is to reduce GHG emissions, the legislation fails to address EPA’s ongoing and duplicative efforts to regulate GHG emissions under the Clean Air Act. There is no rational reason to have multiple regulations imposed on the

power sector which seek the same endpoint. Doing so will have the effect of driving up consumer prices, threatening electric reliability and limiting fuel diversity.

If the objective is to reduce utility GHG and other emissions, and do so at the lowest incremental cost, then there is no basis to exclude any clean energy resources that are connected to the North American grid. “Clean energy” resources that are available to U.S. consumers from across the border should be considered qualifying resources under the Act.

Similarly, there is no reason to treat biomass energy any differently than other clean energy or renewable energy resources. As crafted, the bill does not consider existing biomass energy clean or renewable; new biomass energy is not considered “renewable” and the definition of new biomass energy is overly prescriptive, and; the speculative nature of the biomass clean energy crediting scheme creates uncertainty.

The time frames and intensity of increasing clean energy requirements envisioned by the Clean Energy Standard Act of 2012 seem extraordinarily aggressive. Either the program’s time frame needs to be lengthened or the program’s goals need to be moderated—or both—to balance the needs for reliable, affordable and available electric energy.

Background

Minnesota Power (MP) is an investor owned utility providing energy services to customers in central and northeastern Minnesota and northwest Wisconsin. Minnesota Power’s northern location and high percentage of industrial customers who operate around-the-clock make MP a winter-peaking utility. Thirteen large power customers (requiring at least 10 megawatts of generating capacity) purchase about half the electricity MP sells. These large power customers compete in competitive global markets. Minnesota Power’s unique load profile makes it imperative that our energy resources be reliable, affordable and available around the clock.

The majority of MP’s steam electric generation is coal-based with the exception of two facilities that burn a mix of coal, biomass and natural gas. These two facilities also provide steam to paper mills. Minnesota Power has achieved significant particulate, SO₂, NO_x and mercury emission reductions associated with our electricity generation through a combination of emission reduction technologies. By 2015 our emissions will be 85 percent less than they were in 2005.

MP has an expanding base of renewable hydroelectric, biomass and wind energy that supports compliance with the Minnesota Renewable Portfolio Standard (25 percent by 2025). Today approximately 15 percent of the energy Minnesota Power sells to its customers is from renewable resources, including hydropower, wind and biomass, up from just 4 percent in 2005. Minnesota Power recently purchased a direct current (DC) line in order to help it meet Minnesota’s “25 by 2025” renewable energy mandate. The DC line provides MP’s customers with greater access to North Dakota wind resources.

Minnesota Power also recently signed a long-term contract with Manitoba Hydro. The contract is critical to enable us to “back-up” our wind resources from North Dakota with dependable hydropower from Canada. We believe this marriage of “wind and water”, which creates a reliable and dispatchable renewable electric resource, is unique in the utility industry.

Specific Comments on S. 2146

Minnesota Power uses a series of policy “screens” to evaluate legislation and proposed regulations that affect the electric utility sector. S. 2146 fails several of these screens, which we elaborate on below.

- Is the Policy Fair and Equitable—Does the policy affect all players across the industry sector in a fair and equitable manner?
 - NO—The exclusion of “small” utilities has the effect of the federal government picking winners and losers. EIA’s recent analysis confirms this by pointing out that . . . “there is likely to be a considerable divergence in the price impacts for customers of exempt and non-exempt electricity providers.” EIA estimates that in some regions the cost difference between exempt vs. non-exempt utilities can vary as much as a factor of two. Exempting certain utilities, restrictive qualifiers for credits and aggressive credit surrender requirements will tend to magnify local and regional differences in energy supply costs.
 - If compliance costs and associated customer impacts of the CES are a concern and the primary reason for the “small utility” exemption, there are better solutions. For example, fully funding the Low Income Home Energy Assistance Program (LIHEAP) is a more direct method to address the energy cost concerns. LIHEAP puts money directly in the hands of the neediest electric consumers across the utility sector. Low income consumers are not limited to

“small” utilities and are found in city centers and urban areas as well as in small towns and rural America.

- The CES treats biomass energy generators differently than other clean and renewable energy options. The CES provides no benefit to existing (pre-December 31, 1991) biomass energy projects, and places significant qualifying burdens on new biomass energy projects.
- Do Consumer Benefits Outweigh the Regulatory Burdens: Do the regulations result in compliance burdens that benefit our customers?
 - NO—One of the fundamental stated purposes of the CES is to reduce carbon dioxide emissions. Yet the bill does not address the concurrent regulatory scheme that the Environmental Protection Agency (EPA) is in the midst of implementing.
 - EPA has recently issued proposed rules under the Clean Air Act with the express intent of regulating new fossil-fueled generation sources. Many believe, and EPA has so much as conceded, that it will eventually extend these New Source Performance Standard regulations to existing sources.
 - Since the CES has the same stated policy outcome that EPA is seeking under its regulatory program, that is to limit carbon dioxide emissions from utility generation sources, then the CES should either preempt the EPA from regulating utility greenhouse gas emissions, or amend the Clean Air Act to make clear that, once the CES is implemented, greenhouse gases from utility generators are not considered a pollutant under the Clean Air Act.
 - Layering on another GHG regulatory program adds costs, complexity and confusion.
- Does the Policy Respect Regional Differences: Are differences across the country factored into the design of the program?
 - NO. Each region of the country has access to different types of renewable energy, yet the bill treats these renewable energy resources in a disparate fashion.
 - Biomass energy, widely available in some parts of the country, is treated differently than other clean and renewable energy resources.
 - Clean energy generation located outside the borders of the United States, yet accessible to electric consumers within the United States, receives no recognition in the bill.
 - Minnesota Power recently entered into a long-term contract with Manitoba Hydro that will enable, not inhibit, additional domestic wind energy resources. The exclusion of clean energy resources located outside the United States but connected to the integrated North American electric grid will increase incremental costs to consumers in the United States and, in our case, will also result in increased overall carbon dioxide emissions. Natural gas is the only other readily available option to back up our North Dakota wind resources if we cannot use clean Canadian hydropower to do so (for more information on our contract and emissions profile see the attachment at the end of these comments).
 - The exclusion of Canadian hydropower also acts as a non-tariff trade barrier, suggesting possible conflicts with the North American Free Trade Agreement.
 - For more detail on the use and clean energy benefits of Canadian hydropower please see the comments submitted for the record by several Canadian Provinces and electric energy entities.
 - Regarding biomass energy, there is no defense for the differential treatment of biomass energy resources as compared to other “renewable energy” resources as defined in the bill (solar, wind, ocean, current, wave, tidal or geothermal energy).
 - For more details on the use of biomass energy see the comments submitted for the record by the Biomass Power Association.
- Is the Policy Technically Feasible—Are the outcomes envisioned or created by the policy achievable in a cost-effective manner in the required time frames.
 - NO. Minnesota Power’s analysis of the predictions in ELA’s recent analysis of the Clean Energy Standard suggests that they are highly optimistic. Significant increases in clean energy generation resources will be needed. Some of these resources have considerable licensing and siting challenges as well as requiring significant investments in related infrastructure to either make the electricity (i.e. natural gas lines to power plants) or get the electricity to market (i.e. electric transmission lines). These major infrastructure additions will need to be in place in just over 20 years.

- From the 2010 baseline, output from nuclear power plants is expected to increase by a factor of 1.8 times by 2035, which will significantly increase the proportion of nuclear energy in the U.S. electricity mix from its current level of 20 percent. Given that we have not built a new nuclear plant in the United States in decades, and nuclear power plants face daunting licensing and siting requirements, this seems unlikely to occur.
- Similarly, the recent EIA analysis shows that, from a 2010 baseline, the output of natural gas generation is expected to increase by a factor of 1.5 times. This may or may not be achievable given the fact that this type of increase would require substantial investments in new gas transmission lines.
- One cannot assume that electricity output from natural gas generation could be increased to make up for baseload capacity deficits if the predicted nuclear output does not materialize. This is because the goals of the CES cannot be met if more natural gas is introduced into the system. Another, as of yet unknown, baseload energy generation technology would be required and in place in order to meet the CES goals.
 - New natural gas generation is likely to receive approximately one-half a credit per unit of energy. Natural gas generation that goes into service after 2023 will immediately fall short of credits needed for its own compliance.
- Non-hydro renewables are predicted to increase by a factor of four as compared to 2010 levels. Within this group, EIA predicts that biomass energy will increase by a factor of over six times from 2010 levels, and wind increases of nearly three times. These seem to be wildly optimistic projections which do not factor in the significant investment in new electric transmission infrastructure to connect these often remote, and in the case of wind, variable electric resources to the grid. Given the unknown treatment of biomass energy in the bill and its questionable ability to count as a clean energy resource, the EIA projection of a 6.6 times increase seems exceedingly optimistic.
- Precluding clean energy resources located outside of the United States from qualifying under the Act only makes a challenging emission reduction policy goal more difficult to attain. Given the aggressive nature and requirements of the Clean Energy Standard, not allowing all clean energy resources connected to the North American electric grid to qualify under the Act violates the policy goal of implementing this program at the lowest incremental cost to consumers.

Conclusion

Minnesota Power believes that expanded clean energy deployment, reductions of greenhouse gas emissions associated with electricity generation, expanded energy conservation and efficiency improvements are all important objectives for U.S. energy policy. Achieving a balance between these sometimes competing objectives is essential for keeping our electricity supply reliable and affordable. Balance is also needed to deliver meaningful progress towards environmental objectives while helping the U.S. economy support existing jobs while creating new well-paying job opportunities.

To mitigate unintended economic impacts the CES needs a mechanism to encourage compliance yet allow flexibility should, for example, unforeseen circumstances prevent deployment of needed clean energy technology. Towards this end, the current structure of the alternative compliance payment provision needs to be reconsidered. By 2035, when more than 80 percent of all energy resources must come from clean energy sources, the alternative compliance payment will be over \$60 per credit. Given that 2035 is just 23 years from today (a short time by electric utility planning standards) this potential cost of compliance could pose serious challenges for residential and energy intensive industrial consumers alike.

The Clean Energy Standard Act of 2012 is directionally correct. However, the breadth of infrastructure investments necessary to meet its objectives will require significant changes to the electricity generation and delivery system in a very short time frame. For example, a massive switch from coal to natural gas generation may appear to be technically possible by 2035. However, since even efficient natural gas will require credit offsets after 2023, the investment costs from these new and long-lived investments will not be fully recovered before they come under intense CES compliance cost pressure.

Minnesota Power believes that the concerns we have raised can easily be remedied and adopting these changes will make the Clean Energy Act of 2012 better. Moderating the overall targets; minimizing regional and local disparities by applying it to all utilities; assuring that the alternative compliance payment is truly an alternative compliance option; allowing all clean energy resources to qualify under

the Act including those connected to the electric grid but located outside the U.S. border, and; preventing redundant regulatory requirements are desirable and easily delivered objectives.

We all want a strong economy and a clean environment, and a Clean Energy Standard for the electric utility sector is a policy intervention that has a lot of merit. Minnesota Power welcomes the opportunity to work with the authors of the Clean Energy Standard Act of 2012 to support our shared objectives. Please contact William Libro (wlibro@mnpower.com) or Michael Cashin (mcashin@mnpower.com) if you have questions or concerns about these Minnesota Power comments to the Clean Energy Standard Act of 2012.

STATEMENT OF THE NATIONAL ALLIANCE OF FOREST OWNERS

Introduction

The National Alliance of Forest Owners (“NAFO”) is pleased to submit a statement to the Senate Committee on Energy and Natural Resources (“Committee”) on the S. 2146, Clean Energy Standard Act of 2012 (“CES”). NAFO is an organization of private forest owners committed to promoting Federal policies that protect the economic and environmental values of privately-owned forests at the national level. NAFO membership encompasses more than 79 million acres of private forestland in 47 states. NAFO members are well positioned to help our nation meet its renewable energy objectives, and NAFO is prepared to work with the Committee and Congress toward that end.

Private working forests are a fundamental part of the strategic natural resources infrastructure of our nation, producing renewable, recyclable, and reusable wood and paper products; sustaining plants and wildlife; producing clean water and air; and providing recreation experiences. Working forests also play a substantial role in helping this country achieve energy independence while reducing greenhouse gas (“GHG”) emissions. Forest biomass is a renewable energy feedstock that can help meet our national renewable energy goals in all regions of the country, if placed on a level playing field with other renewable energy sources. Thus, biomass will play a vital role in an “all-of-the-above” approach to American energy production.

NAFO urges this Committee to take care to avoid picking winners and losers in the public marketplace; any definition of qualifying renewable energy feedstocks should provide a level playing field for market access. The CES should recognize that forest owners already work within a well-established framework of laws, regulations and non-regulatory programs and actions that apply to all aspects of forest management, including biomass production, and that promote and maintain responsible forest stewardship with proven results.

II. Private forests provide jobs for millions of Americans and contribute significantly to the nation’s economic well being

According to a recent national study, private forests in the United States support over 2.4 million jobs, \$87 billion in paychecks to employees, and \$115 billion in economic contributions. Forests and the manufacturing they support are key employers in many states.

Private working forests and the jobs they support depend upon reliable markets for continued viability. The U.S. has experienced sustained growth in its forest resources in concert with an ever-increasing demand for renewable forest products. This is attributable at its core to the fact that viable markets for forest products keep forestland economic compared to other uses, spurring investment in forest management and limiting forest conversion to other land uses that otherwise would yield a greater economic return.¹ When existing markets for their products are strong, or when new markets like renewable energy emerge, forest owners are able to invest in tree planting and forest health treatments which help maintain the private forest land base, keep private forests economically competitive with other land uses, and maintain family-waged jobs in the forestry sector.

The Federal government should take actions to encourage viable markets for forest products and maintain a regulatory framework that encourages forestry as a viable land use that will continue to provide good paying jobs in rural communities and provide multiple public benefits for all Americans.

¹Environmental Effects of Land-Use Change: The Role of Economics and Policy, Ruben Lubowski, et al., USDA Economic Research Service. Economic Research Service Report No. 25 (Aug. 2006).

III. Our nation will not meet its objectives to increase our reliance on secure, domestic sources of renewable energy without the contributions of working forests

Wood is a dependable, domestic renewable energy resource that can be utilized for energy production through a variety of processes like biomass generation, wood gasification, and conversion to cellulosic biofuels. Wood, wood residuals, and other plant material can be utilized to produce steam and heat hot water boilers. Steam can be converted to electrical power by turbines or used to heat buildings through piping distribution networks. Newer “wood gasification” technologies heat wood in an oxygenstarved environment, collect gases from the wood, and later mix the gases with air or pure oxygen for combustion. Wood gases can be cooled, filtered, and purified to remove pollutants and used as fuel for internal combustion engines, micro-turbines, and gas turbines.

As members of the Committee are aware, biomass already produces roughly 40 percent of the nation’s non-hydro renewable electricity.² Existing state CES policies reflect the importance of utilizing biomass to successfully lower demand for traditional fossil fuels. To help meet renewable energy goals, at least 38 states and the District of Columbia have included biomass as a renewable generation source.³

A federal CES that does not appropriately include all forms of forest biomass poses challenges to regions of the country where forest biomass is the prevailing renewable energy source and where wind, geothermal, solar, or hydroelectric power are not expected to make a significant contribution. Moreover, a federal standard that does not acknowledge or encourage the full use of forest biomass will jeopardize the nation’s ability to meet its renewable energy objectives.

IV. Utilizing working forests will both meet our nation’s energy needs and help reduce atmospheric GHG concentrations

Experts have long recognized working forests as a source of real and verifiable reductions in greenhouse gas emissions and a cost-effective source of industrial GHG offsets. The United Nations’ 2007 Intergovernmental Panel on Climate Change (“IPCC”) highlights forest management as a primary tool to reduce GHG emissions. The IPCC states: “In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest stocks, while producing an annual sustained yield of timber, fiber or energy from the forest, will generate the greatest mitigation benefit”.⁴

Similarly, the EPA has concluded that there is “scientific consensus” . . . that the carbon dioxide emitted from burning biomass will not increase CO₂ in the air if it is done on a sustainable basis.”⁵ This position is supported not only by the IPCC, but also by the Energy Information Administration (“EIA”), the World Resources Institute (“WRI”) and other credible scientific bodies. EPA is currently in the midst of a scientific review of the climate impacts of biogenic CO₂ emissions, which will inform EPA policy under the Tailoring Rule and other related actions. Although EPA’s policy decisions are still forthcoming,, current research consistently demonstrates that, when viewed on appropriate temporal and spatial scales, the combustion of woody biomass for energy does not increase atmospheric CO₂ concentrations and instead provides significant climate benefits by displacing fossil fuels.

Appropriately including forest biomass in a CES standard would take full advantage of these carbon mitigation benefits in the energy context. Likewise, a policy that discourages forest biomass utilization will forfeit these benefits, particularly in areas where fossil fuels are the predominant source of energy production and where alternative forms of renewable energy, such as wind, solar, and geothermal, are not viable options.

²U.S. EIA at http://www.eia.gov/cneaf/alternate/page/renew_energy_consump/table3.html. Biomass is the primary energy source for 54.3 billion kilowatt hours of the 141 billion kilowatt hours of non-hydro renewable energy produced in 2009.

³Source: Database of State Incentives for Renewable Energy, available at <http://www.dsireusa.org/>.

⁴Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, page 543.

⁵ Environmental Protection Agency Combined Heat and Power Partnership, Biomass Combined Heat and Power Catalog of Technologies, 96 (Sept. 2007) available at www.epa.gov/chp/documents/biomass_chp_catalog.pdf.

V. Forest owners work within a well-established framework of laws, regulations and non-regulatory programs and actions that maintain responsible forest management

Private forestry operations are governed by a fairly complex set of laws, regulations, as well as non-regulatory policies at the federal, state, and local levels. While the resulting framework is fairly complicated and can vary widely between jurisdictions, overall it has been very effective in improving the environmental performance of forestry operations, and can be expected to do so in the future.

Under this framework, working forests provide significant environmental benefits while producing important economic benefits like renewable energy. Watershed protection, wildlife habitat, carbon dioxide absorption, and other “environmental services” are currently provided by private landowners at little or no cost to society. Whenever policymakers consider new environmental requirements on private forestry, such as eligibility requirements for forest biomass intended for energy use, the implications for the economic viability of working forests should be considered. If new regulatory requirements reduce the private forest owner’s ability to realize value from a working forest, or if new market limitations constrain market opportunities for working forests, private forest owners might be compelled to consider other uses for their forests, which could result in the reduction of many of the broader environmental benefits they provide.

VI. Definitions of eligible biomass feedstock should put working forests on an even playing field with other renewable energy sources

Definitions of qualifying renewable energy feedstocks should provide a level playing field for market access across all feedstock sources and encompass the full range of forest biomass, including trees and other plants, forest residuals (e.g., tops, branches, bark, etc), and byproducts of manufacturing (e.g., sawdust, bark, chips, dissolved wood retrieved from the paper-making process, etc). Presently there are at least four different definitions of qualifying forest biomass in the major federal statutes affecting biomass energy production.⁶ This adds complexity and confusion for project developers, biomass producers, and federal program administrators who are required to determine how the various, and at times conflicting, definitions interact with one another.

Some of these statutes define biomass in a clear, yet broad manner and allow biomass to compete with other renewable energy sources on a level playing field. For example, the Food, Conservation, and Energy Act defines biomass as “any organic material that is available on a renewable or recurring basis.” 7 U.S.C. § 8101(3)(A). To avoid any confusion, the definition goes on to explicitly include “trees grown for energy production.” Id. § 8101(3)(B)(ii). This definition is broad enough to include all forest-based biomass feedstocks without restriction.⁷ At the same time, it provides clarity and regulatory certainty, allowing private forest owners to invest in forests with confidence that their products will be allowed to compete in renewable energy markets without facing unnecessary regulatory hurdles.

In contrast, other definitions, such as the definition of eligible forest biomass in the Energy Independence and Security Act of 2007 (“EISA”), place complicated and arbitrary parameters on significant acreages of private forestlands in the form of land use restrictions. These restrictions needlessly disqualify millions of acres of private forest as a source of renewable energy and foreclose new market opportunities for forest owners who are already reeling from steep declines in traditional markets such as solid wood and pulp and paper manufacturing. It also places forest biomass at a significant disadvantage to other biomass feedstocks, such as short rotation agricultural crops that require more energy, nutrients and water to grow, as well as other renewable energy sources.

If applied to a federal clean energy standard, the EISA definition or any other definition establishing arbitrary or complicated parameters on the use of biomass would discourage necessary and appropriate forest management activities that promote forest health and sustainability. Such a definition would also create complex chain-of-custody requirements that would discourage electricity producers from using biomass because of the cost and complexity of compliance and the associated

⁶ Separate definitions of eligible forest biomass can be found in Section 45 (c)(3) of the Internal Revenue Code (26 U.S.C. 45(c)(3)); Section 203(b)(1) of the Energy Policy Act of 2005 (42 U.S.C. 15852(b)); Section 201(1)(I) of the Energy Independence and Security Act of 2007 (42 U.S.C. 7545(o)(1)(I)); and Section 9001(13) of the Food, Conservation, and Energy Act of 2008 (7 U.S.C. 8101 (3))

⁷ However, even this broad definition excludes recycled paper and fails to address mill residues, a critical feedstock for many facilities utilizing biomass energy. Both should be included in a definition of biomass.

legal uncertainty. If identifying qualifying feedstock becomes too complex or costly, project developers will forego the development of biomass facilities altogether, thereby potentially placing the overall CES in jeopardy.

VII. NAFO is prepared to work with Congress and other stakeholders to realize the contributions of working forests in energy policy in an environmentally responsible way.

NAFO is prepared to help develop a constructive approach to using forest biomass to help meet our nation's energy needs. Notwithstanding the strong record of environmental benefits private forests provide, NAFO is prepared to continue to work with policy makers and other stakeholders to ensure that forest biomass, and all other sources of renewable energy, help meet our renewable energy objectives in an environmentally responsible way. NAFO suggests the Committee apply the following principles when crafting legislation addressing the eligibility of forest biomass as a renewable energy source:

1. Federal renewable energy policy should promote rather than discourage the use of forest biomass for renewable energy—Federal policy, and definitions of qualifying forest biomass in particular, should be broad and inclusive so as to encourage forest biomass utilization and foster cost-effective compliance. If definitions and compliance requirements become too complex (e.g. the EISA definition), they will place forest biomass at a disadvantage with respect to other feedstocks or renewable energy sources and ultimately discourage its use. This, in turn, would jeopardize the overall goal of the CES and reduce the carbon mitigation and other environmental services private working forests provide.

The proposed definition's focus on site-specific land management practices will require forest owners and biomass energy producers to maintain complex chain-of-custody records that will vastly increase compliance costs and ultimately discourage the production of biomass energy. The definition of biomass must focus on the carbon benefits of biomass feedstocks, not the location or method of harvest.

2. Federal policy should provide clarity and regulatory certainty in order to promote investment in private forests and preserve the environmental benefits of working forests—Federal policy should promote predictability and regulatory certainty so that private landowners can invest in forests with confidence that regulatory programs and interpretations will support a stable marketplace. New markets, such as renewable energy, help supplement disappearing markets and provide new reasons to keep our forests growing sustainably for the long term. Definitions of qualifying biomass that are complex, ambiguous, or arbitrarily exclude biomass will create market and legal uncertainty and reduce private investments in forests and in renewable biomass energy. Likewise, definitions of renewable biomass that seek land use objectives that are tangential to renewable energy policy objectives will create strong regulatory disincentives and legal uncertainty regarding the use of biomass in both future and existing facilities.

The proposed definition includes many ambiguous terms, including the requirement to “maintain and restore the composition, structure, and processes of ecosystems.” This ambiguity will generate regulatory uncertainty and limit investment in renewable biomass energy as regulated entities will be unable to determine whether biomass feedstocks will qualify under the CES program. Moreover, the definition's consideration of “diversity of plant and animal communities, water quality, and the productive capacity of soil and the ecological systems” would introduce tangential land use objectives that are unrelated to renewable energy production and would unnecessarily complicate the CES program.

3. Federal policy must place all forms of renewable energy on an even playing field—Accomplishing our nation's renewable energy goals will require an “all-of-the-above” strategy. Rather than picking winners and losers among renewable energy sources, Federal policy should treat all types of renewable energy equally and allow market forces to dictate choices among renewable energy options. Policies that exclude biomass from “renewable energy,” narrow the definition of renewable biomass, or discount the production of renewable biomass energy by applying “carbon intensity factors” will arbitrarily limit the production of renewable biomass energy and the environmental benefits it provides.

The proposed definition of “renewable energy” excludes biomass and arbitrarily distinguishes it from other renewables such as solar, wind, and geothermal energy. This exclusion would discourage investment in biomass energy by sending the message that biomass is something other than renewable. Moreover, the bill's inclusion of “carbon intensity factors” creates additional disincentives for biomass energy by only allowing it to obtain a fraction of the credit provided to “renewable energy” sources. The CES definitions should treat all renewable energy sources equally and allow market forces to operate free of regulatory interference.

4. Federal policy should acknowledge and support existing federal, state, local, and nongovernmental forestry practices and capabilities—Federal policy should acknowledge and support the existing framework of federal, state, and local laws, practices, and capabilities and avoid overlaying on top of them new and potentially conflicting federal requirements that would introduce unnecessary complexity and legal uncertainty. The existing framework is well suited to address local conditions and needs. Federal policies should also assume that this framework will continue in the long-term and be applied to all forestry practices, whether associated with traditional or emerging markets.

Forest owners are already subject to a host of regulations that promote “diversity of plant and animal communities, water quality, and the productive capacity of soil and the ecological systems,” many of which are specifically tailored to local conditions. There is simply no need to overlay a duplicative national standard that will lack the flexibility to address local conditions and needs.

5. Federal policy should recognize that state and local resource professionals are best positioned to identify and address changing resource conditions and emerging needs—Given the uniqueness and diversity of forest ecosystems across the nation, it is extremely problematic to set forest management or land use standards in a Federal policy. Potentially changing resource conditions and needs are best addressed with a more tailored approach at the local level by state and local authorities using existing tools, common forestry practices, and well-established procedures.

State and local authorities should continue to fulfill their responsibilities to assess any changing resource conditions associated with existing or future forest practices, including the use of biomass to meet federal energy standards, and make a determination as to whether additional measures are needed to address emerging needs. If state or local authorities determine that additional measures are necessary, they should be allowed to continue the current practice of identifying and taking necessary corrective measures, following the BMP model that has proven highly successful across the country in protecting water quality.

VIII. CONCLUSION

NAFO strongly supports our nation’s efforts to establish new sources of renewable energy, and thereby reduce its dependence on fossil fuels and imported energy. America’s working forests can play a fundamental role in meeting these new and growing energy needs. U.S. policies should encourage investment in forests as a source of renewable energy, by establishing non-restrictive definitions of forest biomass eligible for use in renewable energy programs.

A Federal CES, if adopted, should fully include forest biomass as a renewable energy source, and ensure that the definition of biomass encompasses the full range of forest biomass, including trees and other plants; forest residuals; and wood by-products including sawdust, bark, wood chips, and dissolved wood. In addition, Federal policy should allow state and local authorities to continue their current role in assessing and responding to local resource conditions and needs associated with renewable energy production. Such an approach will enable our country to meet its renewable energy objectives and allow working forests to make their full contribution to our energy future while also reducing overall GHG emissions and providing clean water, wildlife habitat quality recreation and other environmental benefits Americans need and enjoy.

SUSTAINABLE SLOPES,
Lakewood, CO, March 9, 2011.

Hon. JEFF BINGAMAN,
*Chairman, Senate Energy & Natural Resources Committee, SD 304 Dirksen Senate
Office Building, Washington, DC.*

Re: Ski Industry Support for S.2146

DEAR SENATOR BINGAMAN:

We are writing to express our support for your Clean Energy Standard (CES) legislation, S.2146. Eightyone (81) ski resorts across twenty-two (22) states support the measure as a framework for boosting the development of domestic clean energy, conserving natural resources, reducing greenhouse gas emissions, reducing the cost of energy over time, and national security. Ski areas support a long-term, stable policy that provides an incentive for companies to use low-carbon energy sources and helps support successful state clean energy programs already existing in 31 states.

The 81 endorsing ski resorts, listed* below, are committed to raising awareness of the problem of global warming and helping apply solutions to solve it. As you know, there are plenty of good reasons for ski resorts to be concerned about climate change and its potential impacts. Apart from environmental impacts, scientific models suggest that as warming continues, we could experience decreased snowpack, warmer nights, wetter shoulder seasons, and reduced weather predictability. All of these changes affect our industry, as fewer operating days would obviously impact our bottom line, warmer nights can impact our ability to make snow, and spring rain can wash away our base at a critical time of year. We view climate change as a long-term problem, and want to implement reasonable, bi-partisan supported measures now to help solve it.

Ski areas have taken tremendous steps to reduce our own GHG emissions. New this season, the National Ski Areas Association initiated "Climate Challenge," voluntary program dedicated to helping participating ski areas reduce greenhouse gas (GHG) emissions and reap other benefits in their operations, such as reducing costs of energy use. Resorts who take the Challenge are required to complete a climate inventory on their resort operations, set a target for greenhouse gas reduction, and implement a new program or project annually to meet the reduction goal. Examples of some of the actions taken so far include lighting retrofits, development of on-site renewable energy including solar and wind and investment in high efficiency snowmaking equipment. Eight ski areas took up the challenge in its inaugural year: Alta Ski Area (UT), Arapahoe Basin (CO), Canyons Resort (UT), Jackson Hole Mountain Resort (WY), Jiminy Peak (MA), Mount Hood Meadows (OR), Park City Mountain Resort (UT), and Telluride Ski & Golf Resort (CO). These founding members of NSAA's Climate Challenge are listed first below as resort endorsers of your legislation. We anticipate many more resorts joining the Challenge in future years and are pleased to keep you apprised of their progress.

Apart from the Climate Challenge, ski areas across the board are developing renewable energy on site through the application of wind, solar, geothermal and micro-hyrdro technology. Ski areas are applying energy-efficient green building techniques, retrofitting existing facilities to save energy, replacing inefficient compressors in snowmaking operations, using alternative fuels in resort vehicle fleets, implementing anti-idling policies and providing or promoting car pooling or mass transit use by guests and employees. Ski areas are also supporting renewable energy by purchasing Renewable Energy Credits (RECs) and providing their customers the opportunity to do the same. The ski industry represents a relatively small source of greenhouse gas emissions, however, we are doing our part to set the example and unify all businesses behind the common goal of addressing the long term issue of climate change.

Please let us know if there is anything else we can do help ensure the passage of S.2146.

Best Regards,

"CLIMATE CHALLENGE" FOUNDING RESORTS,
*Alta Ski Area (UT), Arapahoe Basin (CO), Canyons (UT), Jackson Hole Mountain
Resort (WY), Jiminy Peak (MA), Mount Hood Meadows (OR), Park City Mountain
Resort (UT), Telluride Ski & Golf (CO).*

PEW CHARITABLE TRUSTS,
Philadelphia, PA, March 6, 2012.

Hon. JEFF BINGAMAN,
Chairman, U.S. Senate, 703 Hart Senate Office Bldg., Washington, DC.

DEAR SENATOR BINGAMAN:

On behalf of the Pew Charitable Trusts, I am writing to thank you for introducing S. 2146, the Clean Energy Standard Act (CES) of 2012 and for your continued leadership on clean energy issues. Over the past decade, clean energy investment, businesses, and jobs have increased dramatically around the world, reaching \$260 billion in 2011. Expansion of the clean energy industry in the United States can spur economic growth, strengthen our national security, and reduce emissions that threaten health and the environment.

Your CES legislation provides a foundation for building a clean energy economy that will spur a new wave of technological innovation, job growth, and manufacturing. Our research shows that clean energy policy is vital to national competitiveness in this sector. Nations with effective clean energy policies— such as a clean

*List has been retained in committee files.

energy standard, renewable energy standards, feed-in tariffs, and clean energy tax incentives—have attracted investment, manufacturing and jobs.

Over the next 25 years, global energy demand will grow by nearly 50 percent, mostly in emerging markets around the world. The United States remains the world's leading source of clean energy innovation, but lags behind in manufacturing and deployment of solar, wind and other technologies. To strengthen our industry, make it more competitive and take advantage of emerging export opportunities, the United States needs to bolster domestic demand. The Clean Energy Standard Act will create that demand and enhance the competitiveness of the U.S. clean energy sector. A CES is an effective, market-based approach that will give investors the certainty they need to finance in American clean energy projects. It will bolster domestic manufacturing of clean energy products and stimulate private sector innovation. And it will help the United States harness the benefits of energy innovations that make our economy stronger, our environment cleaner and our nation more secure.

We applaud the inclusion of industrial efficiency policies such as combined heat and power (CHP) in the CES. However, a broader CES that includes waste heat recovery, district energy, and other technologies that utilize wasted heat, can create even more jobs and further expand the clean energy economy. For example, a study by the Oak Ridge National Laboratory found that doubling the U.S. production of combined heat and power and waste heat recovery by 2020 could create up to 1 million highly skilled jobs. The Pew Charitable Trusts applauds you for your 30 years of leadership on energy issues and joins you in seeking pragmatic policies for enhancing our energy independence and security. Without effective, forward-looking policy, the U.S. competitive position in clean energy is at risk and capital is sitting on the sidelines. We look forward to working with you to secure passage of S. 2146.

Sincerely,

PHYLLIS CUTTINO,
Director, Clean Energy Program.

STATEMENT OF REMA (RENEWABLE ENERGY MARKETS ASSOCIATION)

Renewable energy trade association recognizes Senator Bingaman leadership in latest clean energy proposal

WASHINGTON, March 1, 2012—The Renewable Energy Markets Association (REMA) applauds Senator Jeff Bingaman's (D-NM) leadership in clean energy through his introduction of the Clean Energy Standard Act of 2012 (CES). The CES calls for retail electric utilities to provide 24 percent of their energy from qualifying clean energy sources beginning in 2015, increasing to 84 percent by the year 2035.

"REMA applauds Senator Bingaman's leadership in on renewable and clean energy legislation," said Josh Lieberman, REMA General Manager. "We know this is a difficult time politically to stand and deliver on clean energy development, but Sen. Bingaman's proposal today will help lead our nation down the path of greater energy security and job creation."

Over the upcoming months, REMA pledges to work with Senator Bingaman and other leaders in clean energy to ensure that the CES does not impinge on the role of the voluntary markets for clean, renewable energy. In 2010, the voluntary market for green power exceeded the electricity needs of 3 million American homes, approximately 35.6 million MWh.

REMA urges policy makers to participate in rigorous debate that allows private consumers to go above and beyond mandates to boost the nation's energy future.

For more information on REMA's Clean Energy Standard position, please visit renewablemarketers.com/pdf/REMA-CES-4.11.2011.pdf

About the Renewable Energy Markets Association (REMA)—The Renewable Energy Markets Association (REMA) is a nonprofit trade association dedicated to maintaining and growing strong markets for renewable energy in the United States. REMA engages in education and advocacy efforts on behalf of an industry coalition of renewable energy marketers, utilities, equipment manufacturers, and others supportive of renewable energy markets. www.renewablemarketers.org

SAN FRANCISCO BAY AREA BIOSOLIDS TO ENERGY COALITION,
May 22, 2012.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, U.S. Senate, Washington, DC.

DEAR CHAIRMAN BINGAMAN:

On behalf of the San Francisco Bay Area Biosolids to Energy Coalition, I request that this statement be made part of the formal record for the Committee on Energy and Natural Resources' hearing of May 17, 2012 into the Clean Energy Standard Act of 2012 (S. 2146).

The San Francisco Bay Area Biosolids to Energy Coalition (BAB2E) represents the interests of seventeen public agencies serving wastewater needs of close to three million citizens and the related industries. BAB2E is dedicated to the construction of an innovative alternative energy project that will provide a biosolids biomass energy solution. The project will deliver clean energy, reduced greenhouse gas emissions, reduced demand on the region's road systems and reduced reliance upon conventional and land intensive disposal options. The project is in alignment with the Administration and Congress's priority to leverage our renewable resources in a manner that will boost energy independence, reduce environmental impacts, and generate new jobs. I have enclosed detailed background information on the project. The priority for this project is vital because conventional disposal options such as land disposal are being constrained or eliminated by changing regulatory conditions and the need to minimize greenhouse gas emissions.

BAB2E initiated its effort to develop this promising energy production technology because of the embedded energy contained in biosolids. According to studies (Water Environment Research Foundation), the energy value contained in the wastewater treatment process exceeds by ten times the energy required to treat the wastewater and biosolids. More important, it is estimated that if this embedded energy is captured and utilized at facilities across the nation, it could meet as much as 12 percent of nation's electricity demand. BAB2E has determined that its ability to utilize biosolids to develop a sustainable energy supply can lead to energy independence of local, public utility operations AND provide a reliable source of alternative energy to the grid for use by the public. During these times of fiscal constraint, the ability to capture and utilize this embedded energy can reduce energy costs to the public and ensure that our efforts to address the energy-water nexus are comprehensively addressed at the federal level.

One of the key foundational actions to leverage this untapped sustainable energy resource is to provide a cogent and unambiguous federal policy that will ensure this biomass resource is developed with a commitment similar to that afforded cellulosic biomass energy projects. This is an important matter.

Under current federal energy policies, biosolids biomass projects appear to be disadvantaged in favor of cellulosic biomass. We understand that the Department of Energy is on course to meet its target of developing adequate supplies of such energy supplies, suggesting that any clean energy standard must take into consideration that biomass opportunities extend beyond cellulosic biomass supplies. This is especially noteworthy as we consider water scarcity and the highly water intensive nature of many cellulosic energy supplies. Biosolids, conversely, provide a readily available feedstock to develop a renewable and sustainable energy supply that does not impose burdens on limited potable water supplies. Equally important, biosolids-generated energy supplies can support other sustainable activities including energy cooling waters and refinery needs. Of course, the development of such a sustainable supply can be married to water recycling and desalination technologies, further reducing the cost of production of such alternative water supplies.

S. 2146 marks an important advancement in the policy debate to establish a baseline of standards for clean energy supplies. Under Section 2, Federal Clean Energy Standards, the bill articulates that a market oriented standard for electric generation that will advance clean energy innovation and that promotes a diverse set of low and zero carbon generation solutions is vital. BAB2E has dedicated its effort to address this priority.

Unfortunately, Section 2 would establish a clean energy standard that inadvertently discriminates against biosolids. This is the situation results from the bill's definition of qualified renewable biomass (Section 610(b)(5)) and qualified waste-to-energy (Section 610(b)(6)).

Section 610 (b)(5) specifies that renewable biomass means that which is "produced and harvested through land management practices that maintain or restore the composition, structure, and processes of ecosystems, including the diversity of plant and animal communities, water quality, and the productive capacity of soil and the

ecological systems.” Biosolids, based on the embedded energy content and the fact that diversion of biosolids from land application to energy production would enhance ecosystems, should enjoy the explicit definition of qualified renewable biomass as extended to cellulosic biomass. We request that the committee amend this section to clarify that the definition of qualified renewable biomass include biosolids by stating:

(5) QUALIFIED RENEWABLE BIOMASS—The term ‘qualified renewable biomass’ means (1) renewable biomass produced and harvested through land management practices that maintain or restore the composition, structure, and processes of ecosystems, including the diversity of plant and animal communities, water quality, and the productive capacity of soil and the ecological systems; or (2) conversion of solids produced at publically owned treatment works.

Similarly, Section 610(b)(6) creates a barrier to entry for this readily available and sustainable clean energy feedstock. Under this provision, qualified waste-to-energy is a produced energy from a series of specific activities. This includes biogas, landfill methane, and animal waste or animal byproducts. Absent from this extensive list of qualified energy sources is biosolids. Our review suggests that this lack of specificity would lead to a disqualification of biosolids. This circumstance exists because regulators distinguish between animal waste and biosolids. Further, while biogas and landfill methane can be generated from the presence of biosolids as “daily cover” for landfills and similar facilities, the vast amount of biosolids far exceeds the capacity of landfills. Yet, the opportunity to recover the embedded energy from biosolids exists, provided that federal policy establishes equitable treatment and consideration of biosolids. Given this discriminatory impact, we strongly urge the committee to amend the definition of qualified waste-to-energy as follows:

(v) animal waste, animal byproducts, biosolids or a combination thereof;
or

This technical revision would clarify that biosolids and the embedded energy would be available to develop sustainable energy supplies alone or in combination with other eligible forms of biomass energy.

The BAB2E Coalition has demonstrated that a critical mass of support exists for this kind of innovative energy production project that will deliver multiple benefits to the environment and deliver a sustainable energy supply directly related to the energy/water nexus. The ability to leverage this opportunity through a clean energy standard will help to propel similar projects across the nation and capture up to 12 percent of the nation’s electricity demands. This is consistent with the Administration’s “all of the above” approach to energy development.

We look forward to working with the committee as you and your colleagues proceed with finalization of S. 2146.

Sincerely,

GARY W. DARLING,
Bay Area Biosolids to Energy.

STATEMENT OF THE WILDERNESS SOCIETY

The Wilderness Society welcomes the opportunity to discuss the proposal of Senator Bingaman and others to establish a Clean Energy Standard (CES) for the production of electricity in the United States. State renewable energy standards already in effect are demonstrating the power of establishing market incentives and suggest that there is an opportunity here to move the nation more quickly in the direction of a low-carbon clean energy system that drives innovation, improves public health, protects our public lands and meets our 21st century energy needs.

Our public lands are managed for multiple uses, including energy development. But the pace, scale and location of projects can significantly degrade the health and integrity of these landscapes. Expanded natural gas extraction in the Rocky Mountain West has boomed in recent years, creating major environmental challenges. Moreover, fossil fuels—oil, natural gas and coal—extracted from federal public lands and waters are major air polluters, accounting for nearly 25 percent of the nation’s energy-related greenhouse gas pollution. For these reasons, we believe national market standards should be evaluated across the full set of impacts and designed to jumpstart more sustainable energy production, not more of the same.

In this regard, we wish to reinforce several points which we have shared with the Committee in earlier comments on the White Paper that preceded the bill.

First, we wish to note a fundamental difference between the proposed CES and a renewable energy standard (RES) or RES and energy efficiency standard (EES) combination common at the state level—that is, the definition of eligible generation technologies. As recently as 2010, the House and Senate have worked to pass bipartisan RES and RES/EES legislation that focuses on moving electricity supply away from fossil fuels. The proposed CES would make nuclear and certain natural gas and coal technologies eligible as well, thus shifting the focus from renewable technologies and energy efficiency applications to a suite of traditional energy sources that include every major electricity source, some of which are anything but “clean.”

For the reasons outlined below, The Wilderness Society strongly prefers an approach which focuses on creating needed new markets for renewable energy and does not include non-renewable sources. We urge the Committee not to expand the list of eligible technologies beyond the traditional suite of renewable sources approved by the Committee on a bipartisan basis in 2009. That list generally reflects a two part test—(1) Is the technology a low-or-no greenhouse gas emitter and (2) Does it need an artificial boost in the marketplace in order to get established?

We believe that there is general agreement that an RES is intended to include solar, wind, geothermal, small hydroelectric, marine and hydrokinetic renewable energy, and biogas and biofuels derived exclusively from eligible biomass. That consensus falls apart when the concept of an RES is extended to the following:

- Nuclear energy—While nuclear energy meets the first test, it clearly does not meet the second.
- Natural Gas—Natural Gas is a major source of greenhouse gas pollution, already thrives in the electricity marketplace, and its use continues to expand under current market and regulatory conditions. It fails on both considerations.
- Coal—Coal-based electricity, even with Carbon Capture and Storage technology attached, remains a major source of greenhouse gases. CCS technology can be, and in fact is, encouraged through traditional forms of support such as tax incentives.

TWS urges the committee to refocus its efforts on tweaking its existing RES blueprint rather than trying to expand the concept to sources that are neither credibly “clean” nor “renewable”.

Second, we urge the Committee to put Energy Efficiency first. Energy Efficiency is the most underutilized inexpensive nonpolluting source of energy in America. The cleanest power plant will always be the one that was rendered unnecessary before it got built because of increased efficiencies in the end use of electricity. Energy efficient appliances, boilers, furnaces, air conditioning, lighting and other energy consuming machines can drastically reduce annual energy consumption. Bringing the existing housing stock up to much higher levels of thermal efficiency was recently found by the National Academy of Sciences to offer the greatest potential for energy savings over the next decade (see, eg, *Real Prospects for Energy Efficiency in the United States*, National Academy of Sciences, 2012). Yet the persistent lack of up-front financing and the failure to account for environmental benefits that do not accrue to the individual consumer have left a huge gap between the level of investment that would maximize net social and environmental benefits and the investments in efficiency strategies actually made by individuals and businesses. Therefore capturing cost savings over time and achieving potential public benefits from private energy reduction have proven to be problems at least as intractable as shifting to more renewable energy sources.

To deal with this challenge, in the 111th Congress the House combined an EES (Energy Efficiency Standard) and an RES, allowing utilities to meet up to a quarter of their 20-percent-by-2020 compliance obligation through energy efficiency measures instead of renewable technologies. The result of this approach would be to complement the Committee’s 15 percent RES with a 5 percent EES. TWS urges the Committee to adopt this approach so that energy efficiency measures, which are the most cost-effective to adopt, are not neglected by utilities seeking to meet the RES standard.

Third, we suggest the following specific improvements in the new bill:

1. Provide incentives for reuse of brownfields—TWS urges the Committee to provide the same incentive for locating new solar, wind and geothermal projects on already-disturbed “brownfields” sites that it provides for locating such projects on tribal lands. Every congressional district has at least one brownfields site, and the EPA has helped identify which of those sites have renewable resource generation potential. By simply building a multiplier incentive into a national RES, utilities would be knocking on the doors of public officials asking for the opportunity to redevelop blighted land, rather than public offi-

cials trying to attract the utilities to sites that they consider problematic. The multiplier incentive is justified by the multiplier effects of such an approach—protection of undisturbed land, development closer to existing employment centers, less pollution, and reuse of existing infrastructure and transmission lines. And by offering a way to bring idle lands back on the tax rolls without dependence on taxpayer dollars, everyone would benefit.

The Wilderness Society, the U.S. Conference of Mayors and a broad coalition of groups has endorsed this small change in the RES that could generate significant new support for the RES concept.

2. Provide improved standards for biomass eligibility:

a. TWS strongly supports the provision that asks the Secretary to engage in a process with the National Academy of Sciences to determine the correct methodology for determining the net greenhouse gas emissions from various forms of biomass harvest, combustion and replanting. Biomass is unlike other renewable energy sources in that it emits both conventional and greenhouse gas pollutants when it is burned. It is unlike fossil fuels in that its removal is not necessarily permanent—as plant material, it can be regrown over a period of decades in a way that can mitigate some of the GHG pollution depending on the original source.

TWS urges the Committee to follow the science of biomass conversion. It makes no sense for some forms of biomass to be considered eligible under RES if they create a carbon debt that cannot be offset for 50 years after the harvest for electricity—as may be the case when the source is whole living trees. On the other hand, no carbon debt is truly caused when the source is the byproduct of activity that is occurring for other economic reasons, such as the waste stream of lumber mills or tree trimming to protect power lines or the safety of homeowners in the wild land-urban interface. These distinctions can and should be made in the definition of what constitutes renewable biomass under an RES.

b. TWS is concerned that the new bill makes no distinction between biomass found on public lands generally versus biomass found in areas of special conservation concern. Under the bill, utilities would submit credits to the Department of Energy and certify compliance. Electricity generated by biomass would qualify as long as the biomass source meets the definition of “qualified renewable biomass” in the bill, regardless of the origin of the biomass.

(5) QUALIFIED RENEWABLE BIOMASS.—The term ‘qualified renewable biomass’ means renewable biomass produced and harvested through land management practices that maintain or restore the composition, structure, and processes of ecosystems, including the diversity of plant and animal communities, water quality, and the productive capacity of soil and the ecological systems.

This is a very broad definition that lacks many of the “no-go” categories contained in earlier iterations of biomass definitions. In the past the Senate Energy and Natural Resources Committee has been careful to protect conservation areas, such as wilderness areas, national monuments (see, eg, section 133 of S. 1462, 111th Congress.) And the definition used for the Renewable Electricity Standards which passed the House in 2010 within the context of the climate bill specifically excluded biomass taken from

. . . components of the National Wilderness Preservation System, Wilderness Study Areas, Inventoried Roadless Areas, old growth stands, late successional stands (except for dead, severely damaged, or badly infested trees), components of the National Landscape Conservation System, National Monuments, National Conservation Areas, Designated Primitive Areas, or Wild and Scenic Rivers corridors.

These careful distinctions are lacking in the new bill, which opens up all federal lands as potential sources of biomass, with any exceptions to be determined by regulations written after the bill passes. This creates enormous uncertainty about whether critical conservation areas will be found to be off-limits.

The regulations themselves are to be written by the Department of Energy because DOE is in charge of certifying compliance. DOE is not a conservation agency, nor does it have expertise regarding “land management practices that maintain or restore the composition, structure, and processes of ecosystems, including the diver-

sity of plant and animal communities, water quality, and the productive capacity of soil and the ecological systems.”

We strongly urge the Committee to restore meaningful distinctions that steer biomass markets away from areas of clear conservation concern and that require strong sustainability criteria as a condition of eligibility. Areas that are managed primarily for their conservation value—such as wilderness areas, wild and scenic river corridors, roadless areas, etc.—should remain outside the commercial pull of RES demand and be managed first and foremost for their ecological health.

Thank you for this opportunity to discuss this important proposal.

UNITED STATES CLEAN HEAT & POWER ASSOCIATION,
Falls Church, VA, March 1, 2012.

Hon. JEFF BINGAMAN,
Chairman, Senate Energy and Natural Resources Committee, 703 Hart Senate Office Building, Washington, DC.

DEAR MR. CHAIRMAN:

As you know, USCHPA is a trade association whose members are leaders in combined heat and power (CHP) technologies.¹ Our membership includes manufacturers, developers, and suppliers who seek sound clean energy policy and marketplace solutions that will facilitate deployment of CHP systems in the U.S. On behalf of the CHP industry, I am writing to commend you for introducing legislation to establish a national Clean Energy Standard (CES) that aptly recognizes the energy and environmental benefits of CHP and effectively incentivizes greater deployment of combined heat and power in the American marketplace.

USCHPA supports the overall policy objectives behind the CES, such as reducing emissions of greenhouse gasses and other emissions, creating new innovation and manufacturing opportunities, and increasing the overall energy efficiency of the American economy. Greater deployment of CHP has the potential to greatly contribute to all of these objectives. For instance, the Oak Ridge National Laboratory estimated in a 2008 study that if the United States adopted high-deployment policies to achieve 20 percent of generation capacity through CHP by 2030, it could save 5.3 quadrillion BTU of fuel annually—nearly equivalent to the total energy consumed by U.S. households. In addition, such policies would create \$234 billion in cumulative investment, and create over one million high-skilled technical jobs.²

In particular, USCHPA is pleased that greater efficiencies under the proposed CES will be awarded with greater credit. CHP system efficiencies average above sixty-five percent, and many new systems achieve efficiencies above eighty percent. In addition, we appreciate that the clean energy standard recognizes the thermal benefits of CHP by making additional credits available under the CES for emissions avoided from not using a separate thermal source.

Thank you for your continued support of CHP and for your leadership toward establishing a cleaner, more efficient economy. The members of USCHPA and I look forward to working with you as the legislation advances through Congress.

Sincerely,

JESSICA H. BRIDGES,
CAE IOM Executive Director.

STATEMENT OF NATIONAL ASSOCIATION OF CLEAN WATER AGENCIES (NACWA)

The National Association of Clean Water Agencies (NACWA) is pleased to have the opportunity to submit for the record this written statement to the Senate Energy and Natural Resources Committee on the occasion of the Committee’s hearing entitled, “Market-Oriented Standards for Clean Electric Energy Generation” held on May 17, 2012.

NACWA is the leading advocate for responsible national policies that advance clean water, clean energy and a healthy environment. The Association represents the interests of more than 350 municipally-owned wastewater treatment agencies and organizations who treat and reclaim more than 18 billion gallons of wastewater each day.

¹ Combined heat and power systems include waste heat recovery, or “bottoming-cycle” CHP systems.

² U.S. Department of Energy, Oak Ridge National Laboratory. December 1, 2008. Combined Heat and Power: Effective Energy Solutions for a Sustainable Future. <http://info.ornl.gov/sites/publications/files/Pub13655.pdf>.

A growing number of NACWA members are beneficially using and producing electric energy from biosolids, a nutrient-rich byproduct of wastewater treatment. While the technologies needed to generate energy from biosolids are proven and mature, clean energy production from the wastewater sector is still an enormously untapped resource.

To help communities across the country take advantage of this abundant carbon-neutral clean energy source, it must be properly encouraged. Energy generated from both biogas and biosolids produced in the wastewater treatment process can and should be eligible to receive full clean energy credit under a National Clean Electricity Standard (CES). Full clean energy credit is a warranted and necessary first step to realizing greater energy production from an abundant resource capable of helping meet our national clean energy goals.

The Wastewater Sector Should Be Included in a Clean Electricity Standard

Today, approximately 104 publicly-owned treatment works (POTWs) produce renewable energy by anaerobically digesting biosolids and using the resulting methane gas. If the policy objectives of a CES are to (1) promote cost-effective clean energy production, (2) create greater energy and resource efficiency, and (3) achieve a net reduction of atmospheric carbon dioxide (CO₂) emissions from the power sector, it should incentivize deployment of energy produced from all sources that helps achieve these goals, including energy produced by the wastewater sector. CES legislation should encourage the total clean energy recovery potential from biosolids and biogas for the following reasons:

- **The Energy Potential in Biosolids is Huge**—The energy potential contained in biosolids exceeds the electricity requirements for treatment by a factor of 9.3 to 1. In other words, domestic wastewater contains almost ten times the energy needed to treat it. This can potentially meet up to 12% of the national electricity demand, enough to power New York City, Houston, Dallas and Chicago annually.
- **Biosolids Are Abundant and Must Be Managed**—Biosolids result naturally and are collected and managed by POTWs to protect human health and the environment. As one of many management options, the emerging trend of energy generation is an efficient and environmentally-beneficial management practice and therefore worth encouraging.
- **Biosolids and Biogas are Carbon-Neutral and Not a Waste**—Unlike other forms of biomass or qualified waste-to-energy types, biosolids are uniquely recognized as being completely biogenic and part of the natural carbon cycle (i.e. a truly carbon-neutral fuel).
- **Energy Recovery Replaces Fossil Fuel Requirements**—When combusted directly or indirectly as digested biogas to produce electricity, the biogenic CO₂ emissions stored in biosolids are recycled efficiently, producing a closed-loop, net reduction in atmospheric CO₂ levels by avoiding release of methane gas and displacing required fossil fuel electricity. EPA estimates that more than 3 million metric tons of CO₂ could be displaced if only the POTWs currently using anaerobic digestion for biosolids management were to deploy technology to actually generate electricity. This is the equivalent of taking nearly 600,000 cars off the roads.
- **Biogas Production Produces Beneficial By-Products**—Digesting biosolids to produce biogas fuel produces a nitrogen-rich fertilizer which can also help displace CO₂ emissions caused by chemical fertilizer production. In addition, digested biosolids result in significant volume reduction requiring far fewer trucks to transport the material off-site, which also results in significant CO₂ displacement. These emission reductions are in addition to the direct reductions of the electricity generated and its use.
- **Projects are Clean, On-site, Reliable and Cost-Effective**—Recovery of energy from biosolids and biogas can decrease the costs communities must bear to treat wastewater and can increase grid reliability.
- **Biosolids Energy Recovery Can Create Jobs and Innovation in Every State**. Biosolids or biogas-to-energy projects are possible in all 50 states, and can create local jobs and spur growth and innovation.
- **Several States have already recognized the energy potential in biosolids**—Utilizing CHP technology, biogas is eligible under 30 state and district renewable portfolio standards as a qualifying renewable energy resource. Enabling biosolids to qualify under a national clean energy standard would support these states' efforts and avoid undermining current market trends.

Technologies Used by Wastewater Treatment Plants to Generate and Recover Energy

Energy can be recovered from domestic wastewater in several different ways. The following list covers the ways that energy can be recovered, briefly describes the technologies used, and their status (common, innovative or under development). While many of these technologies are mature and already in place at some utilities, current rates of utilization are low. Including biogas and biosolids produced in the wastewater treatment process in a national CES would rapidly increase employment of these technologies throughout the sector.

Mature Technologies Underutilized by the Wastewater Treatment Sector Include:

- **Anaerobic Digestion**—An established technology to process biosolids is anaerobic digestion which produces biogas (methane). The biogas can be used to generate electricity, heat or direct power. The technologies used to co-generate electricity from biogas include internal combustion engines, external combustion engines (Stirling), micro turbines, and fuel cells (emerging). The engines also generate heat which can be recovered. Biogas can also be used to produce heat required for treatment or to operate boilers. Each million gallons per day (MGD) of wastewater flow can produce enough biogas in an anaerobic digester to produce 26 kilowatts (kW) of electric capacity and 2.4 million Btu per day (MMBtu/day) of thermal energy in a Combined Heat and Power (CHP) system. This is mature technology and commonly used. However, on a national scale, the technical potential for additional CHP at WWTFs is over 400 MW of biogas-based electricity generating capacity and approximately 38,000 MMBtu/day of thermal energy. This capacity could prevent approximately 3 million metric tons of carbon dioxide emissions annually, equivalent to the emissions of approximately 596,000 passenger vehicles.
- **Hydraulic Head Loss**—Energy in the form of hydraulic head loss is available in most wastewater systems. This is the energy from water stored at a higher level as it falls to a lower level. Turbines are used to convert the energy from the force of falling water to electric current. A few treatment plants, such as San Diego, CA, use large turbines to capture this energy and produce electricity. A more recently popular technology, applicable in more systems, are micro (mini hydro) turbines which use low head loss to generate electric current. This is mature technology and available for widespread use. Hydrokinetic energy, or the energy from flowing water, can also be captured by some emerging technologies.
- **Thermal Energy**—Energy in the form of thermal energy can be extracted from most domestic wastewaters as the temperature of the water is warmer than the air and ground. Heat pumps are used to extract this energy which can be used by the wastewater treatment facility to offset their demand for heat. This technology works best in cold climates, and has been used in Scandinavia. Some applications are underway in the U.S. (Aspen, CO). This is mature technology but not yet commonly used in the U.S.
- **Biosolids Thermal Oxidation**—Solids are removed from domestic wastewater in the treatment plant. Several types of technologies can be used to recover energy from these solids. Dry solids can be burned or incinerated. This is an established technology but new designs are making this process more efficient and reducing the need for additional energy sources to keep the process going. In most new applications and retrofit incinerator designs, there is the ability to recover heat. This is mature technology and commonly used, but still considered underutilized.
- **Biogas as Fuel**—Recently, biogas generated by the wastewater treatment process has been sold to natural gas suppliers and used to fuel vehicles retrofitted to run on natural gas. Biogas can be used to run direct drive engines which power pumps and other equipment. This is mature technology but not commonly used.
- **Gasification**—New technologies are on the market that convert wastewater solids to combustible gases through pyrolysis or gasification. These gases are carbon-based and energy rich, but are different from methane. Gasification is the transformation of solids under high temperatures into a carbon-rich substance called “char”, which is subsequently gasified producing a gas called syngas that can be used as fuel to generate electricity and heat. Pyrolysis is a process used to produce oil from sludge under heat and pressure. These combustible gases can be used in engines to generate electricity similar to the equipment to convert biogas. Heat can also be generated and recovered. Sometimes these gases can be used as feedstock to produce combustible products such as oil and syngas.

Emerging Technologies Still Under Development:

- Nutrient-rich Algae—The constituents in wastewater also have energy recovery potential, but little has been done beyond the research stage at this time. The nutrient-rich effluent can be used to grow algae. The algae can be harvested and used to generate fuel feed stocks. Sunnyvale, CA, harvests algae and co-digests the algae with other solids to generate biogas. This is emerging technology that still requires research and development.
- Microbial Fuel Cells—A new technology emerging from laboratory research is the microbial fuel cell. A small amount of electricity is released during microbial transformation of both carbon and nitrogen compounds in wastewater during treatment. New advances in nanotechnology allow this energy to be recovered. This is an emerging technology and there are no full scale applications yet, but it looks promising.
- Nitrous Oxide Capture from Biological Nitrogen Removal for Power—Biological nitrogen removal processes are based on microbial conversions that release nitrous oxide as a byproduct. It may be possible to capture the nitrous oxide emitted from these processes and burn the nitrous oxide to generate additional power or electricity. This technology is also in the research stages and has not been applied at any treatment facility.

The Clean Energy Standard (CES) Act of 2012 (S.2146)

The Clean Energy Standard Act of 2012 (S. 2146), introduced by Senator Jeff Bingaman (D-NM) earlier this year, employs a market-based approach to accelerate deployment of a wide variety of power generation technologies and feedstocks. NACWA welcomes this legislation and encourages policymakers to include all energy derived from the wastewater treatment sector as qualifying energy sources.

As currently written, the Clean Energy Standard Act of 2012 would credit biogas energy recovered from wastewater biosolids in a CES. However, the bill discriminates against older facilities by discrediting biogas produced at wastewater treatment plants built before 1992. We urge Congress to amend the December 31, 1991 cut-off date so that the wastewater sector may participate in the clean energy market and help meet federal renewable energy targets. Furthermore, this bill does not credit energy produced from dry wastewater biosolids used as feedstocks for certain types of technology. For example, dry biosolids are used in cement kilns as an energy source, reducing the need for those cement kilns to use as much coal or other forms of higher CO₂-intensive energy sources. This is an often overlooked energy option as renewables regulators are often unfamiliar with biosolids. Yet with a consistent, predictable and sustainable supply, it would be foolish to neglect this energy-rich resource.

Beyond these critical adjustments, we would recommend that biogas and solids produced by the municipal wastewater treatment process be provided its own separate category of qualifying clean energy sources. The clean energy and environmental benefits provided by this resource warrants separate categorical treatment to ensure optimal deployment. Proper inclusion and recognition of the clean energy potential of biosolids and biogas recovered and produced by municipal wastewater treatment plants begins by recognizing its unique differences from other types of energy resources. That potential should be captured properly and fully promoted in any final CES legislation.

If you have any further questions regarding the intrinsic clean energy potential of biosolids and biogas, or how a CES should account for and promote such potential, feel free to contact Hannah Mellman at hmellman@nacwa.org.

STATEMENT OF THIRD WAY FRESH THINKING

Third Way has long supported a clean energy standard as a way to help get America moving on clean energy. This will enable the United States to compete in the \$2.3 trillion global clean energy market, reduce pollution, and accelerate innovation. Chairman Bingaman's Clean Energy Standard Act of 2012 is a very important step in that direction. The bill is technology neutral, giving utilities a variety of options in how they choose to comply. It also provides businesses with the certainty they need to invest in clean energy.

The Clean Energy Standard Act embraces a truly all-of-the-above strategy that empowers utilities and states to choose the best strategy for them to move to clean energy. This includes not only critical renewable energy sources like on- and off-shore wind, concentrated solar, solar photovoltaic, and hydropower, but also combined heat and power, natural gas, and nuclear energy.

This technology-neutral approach will minimize the cost of reducing pollution and allow different regions to harness the resources that are most economical for them to accomplish a national goal. The fact that 37 states now have goals or requirements for increased generation of clean energy shows there is strong support for the concept of aCES. Yet the diversity of these state requirements shows the importance of giving utilities as many tools as possible to meet that standard. As the debate on aCES continues, Third Way would advocate for greater inclusion of efficiency measures as an additional tool that can be used to meet the standard.

Chairman Bingaman's proposal also provides industry with the certainty it needs to make long-term investment decisions. New electricity generation is expensive, with costs often reaching into the billions of dollars for a single plant. These facilities can take years to build and can be operated for decades. To make such large investments with long-term payoffs, utilities need certainty as to what the government will require of them and the confidence that the rules of the game won't be changed.

In today's global economy, the developed countries that succeed have modern infrastructure, innovative industries, and reduced pollution. Even China has a plan in place to increase its use of clean energy. The United States cannot compete if we do not set high standards for our private sector to reach so that we can remain the world's leading economic power. While we are confident that the Chairman will refine and improve it, Clean Energy Standard Act will move us in the right direction.

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