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Hearing on The Clean Energy Standard Act of 2012

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 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.

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.

<u>State experience with renewable and alternative energy standards</u>

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-mandatory 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.

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.

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 CO_2 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 CO_2 as a resource, rather than treating it as a waste product. C2ES is a co-convener 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 CO_2 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 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.

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