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Energy Market Impacts of a Clean Energy Portfolio Standard

- Follow-up -

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Preface and Contacts

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The model projections in this report are not statements of what will happen but of what might happen, given the assumptions and methodologies used. The reference case projections are business-as-usual trend forecasts, given known technology, technological and demographic trends, and current laws and regulations. Thus, they provide a policy-neutral starting point that can be used to analyze policy initiatives. EIA does not propose, advocate, or speculate on future legislative and regulatory changes. All laws are assumed to remain as currently enacted; however, the impacts of scheduled regulatory changes, when defined, are reflected.

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Executive Summary

This report responds to a request from Senator Coleman (MN) to analyze a proposed clean energy portfolio standard (CEPS). The proposal, a copy of which is provided in Appendix B, requires electricity suppliers to increase their share of electricity sales that is generated using clean energy resources, including: nonhydropower renewable resources, new hydroelectric or nuclear resources, fuel cells, and fossil-fired plants that capture and sequester carbon dioxide emissions.[1] Electricity suppliers may also comply by purchasing tradable clean energy generation credits from other sellers or by buying credits from the Federal government at a price of 2.5 cents per kilowatthour (2005 dollars, with inflation adjustment). Suppliers are not required to hold credits in excess of their total incremental sales growth from their baseline levels, which is the average of their sales from 2008 to 2011. Electricity suppliers with fewer than 500,000 megawatthours of sales are exempt from these requirements. Suppliers can also accumulate credits from eligible generation in the five years before program enactment, which they may use freely throughout the subsequent periods. This analysis is based on the reference case from the *Annual Energy Outlook 2006* and is a follow-up to an earlier analysis of a clean energy portfolio standard prepared in June 2006.[2, 3]

The key findings include:

- Beginning in 2015, the first year of mandatory program compliance, the proposal spurs the development of clean energy resources well above reference case levels. By 2030, projected renewable energy generation is nearly double the level in the reference case and nuclear generation is 27 percent greater (Table ES-1) than in the reference case.

- Early credits earned during the 5 years preceding 2015 can be used throughout the 2015 to 2030 period, but they are expected to be most heavily used between 2020 and 2025 when the program targets increase sharply.

- During the first phase of the CEPS, from 2015 through 2019, credit prices range from 0.4 to 1.0 cent per kilowatthour. During the second phase of the program, from 2020 to 2024, credit prices rise, but stay below 2.0 cents per kilowatthour. During the third phase of the program, 2025 and beyond, credit prices temporarily hit the 2.5-cents-per-kilowatthour price cap when the required share first increases to 20 percent; however, as fossil fuel prices increase and new nuclear and renewable facilities are built, credit prices fall.

[1] The program targets formally begin in 2015. The credits from carbon sequestration and retrofit technologies are limited to 10 percent of the retailer supplier's obligation according to section "c.2." The percentage shares of clean fuel use prescribed are: for 2015-2019, 10 percent; for 2020-2024, 15 percent; for 2025 and thereafter, 20 percent.
[2] Energy Information Administration, *Annual Energy Outlook 2006*, DOE/EIA-0383(2006) (Washington, DC, February 2006). Web site http:// www.eia.doe.gov/oiaf/aeo/index.html.
[3] Energy Information Administration, *Energy Market Impacts of a Clean Energy Portfolio Standard*, SR/OIAF/2006-02 (Washington, DC, June 2006). Web site http://www.eia.doe.gov//oiaf/servicerpt/emice/index.html.

- Biological sequestration programs supply 10 percent of the credit requirements – the maximum share permitted – in all years. While there is uncertainty about the potential of such projects and their ability to sequester carbon, the 1,000 clean energy credits they earn for each metric ton sequestered make them economically attractive.

- Almost 76 percent of generation eligible for credits in 2030 is from nonhydropower renewable technologies (669 billion kilowatthours of the required 883 billion kilowatthours). Most of this is from biomass, both dedicated and co-fired, (366 billion kilowatthours) and wind (210 billion kilowatthours) generation.

- New nuclear plants, which receive one-half credit per kilowatthour of generation, account for 291 billion kilowatthours of eligible generation.

- Additional compliance generation comes from geothermal technologies (60 billion kilowatthours), with lesser amounts from landfill gas and solar technologies.

- From 2006 to 2030, the CEPS has a cumulative total cost to the electric power sector of approximately $7.8 billion (all prices and costs are in 2004 dollars and cumulative calculations are discounted at 7 percent to 2006). This is less than 0.5 percent of the cumulative discounted industry costs in the reference case. This estimation includes $22 billion in higher capital and fixed operations and maintenance expenditures that are partially offset by $14 billion in lower fuel costs.

- Compared to reference case figures, cumulative residential expenditures on electricity from 2006 through 2030 are $4.7 billion (0.3 percent) higher.

- Average end-use electricity prices increase with the proposal requirements, but the impact is small and it varies over time. The largest increases are in 2020 through 2022 and in 2029, when annual electricity prices are slightly more than 1 percent (nearly 0.1 cent) above reference case levels. However, by 2030 end-use electricity prices are only 0.02 cents (0.3 percent) higher.

- In 2030, electricity sector carbon dioxide emissions are 14.7 percent lower in the CEPS case than in the reference case, but still 23.1 percent higher than 2004 levels. Between 2006 and 2030, total cumulative U.S. electricity sector carbon dioxide emissions are 4,162 metric tons lower (5.8 percent) than in the reference case.

Table ES-1. Key CEPS Analysis Results, 2020, 2025 and 2030

	2004	2020 Reference	2020 CEPS	2025 Reference	2025 CEPS	2030 Reference	2030 CEPS
Generation (billion kilowatthours)							
Coal	1,977	2,505	2,302	2,896	2,547	3,381	2,803
Petroleum	120	107	109	108	103	115	108
Natural Gas	702	1,103	1,090	1,070	968	993	889
Nuclear Power	789	871	892	871	967	871	1,109
Conventional Hydropower	269	303	302	303	302	303	302
Geothermal	14	34	37	47	55	53	60
Municipal Solid Waste/Landfill Gas	22	29	34	30	36	30	37
Dedicated Biomass	36	51	53	63	119	77	285
Biomass Co-Firing	1	36	177	29	188	26	126
Solar[A]	1	3	3	4	4	6	6
Wind	14	60	97	63	201	65	210
Total	3,955	5,108	5,104	5,492	5,498	5,926	5,944
Clean Energy Portfolio Standard Compliance							
Electricity Sales (billion kilowatthours)	3,567	4,629	4,621	4,956	4,945	5,341	5,326
Percent Clean Energy Required[B]	0.0	0.0	9.4	0.0	13.8	0.0	16.6
Generating Capacity (gigawatts)							
Coal Steam	310	345	336	390	365	457	394
Other Fossil Steam	124	80	81	79	78	75	74
Combined Cycle	159	214	208	226	215	231	218
Combustion Turbine/Diesel	130	149	150	159	160	174	174
Nuclear Power	100	109	112	109	122	109	139
Other	0	1	1	2	3	6	7
Conventional Hydropower	78	78	78	79	78	78	78
Geothermal	2	5	5	6	7	7	8
Municipal Solid Waste/Landfill Gas	3	4	5	4	5	4	5
Wood and Other Biomass	6	8	10	10	19	12	42
Solar	1	1	1	2	2	3	3
Wind	7	19	30	20	60	20	63
Total	936	1,027	1,032	1,098	1,126	1,186	1,215
Price (2004 cents per kilowatthour)							
Credit Price	0.00	0.00	1.25	0.00	1.98	0.00	1.52
Retail Electricity Price	7.6	7.2	7.3	7.4	7.4	7.5	7.5
Electric Power Sector Emissions (million metric tons)							
Carbon Dioxide	2,299	2,835	2,649	3,052	2,711	3,318	2,830
Fuel Prices							
Natural Gas Wellhead Price (2004 dollars per thousand cubic feet)	5.49	4.90	4.91	5.43	5.26	5.92	5.78
Coal Minemouth Price (2004 dollars per ton)	20.07	20.20	19.71	20.63	19.53	21.73	20.17

[A] Includes solar thermal power, utility-owned photovoltaics, and distributed photovoltaics.
[B] Incremental legislative target expressed as share of total same-year sales, accounting for exempt small retail suppliers and biological sequestration.

Source: National Energy Modeling System runs: AEO2006.D111905A and AEO06_NWCOLES.D111606A

1. Background

This report responds to a September 12, 2006, request from Senator Norm Coleman for an assessment of a proposed clean energy portfolio standard (CEPS) that would require each retail electricity supplier to provide an increasing share of its sales from zero and low-carbon dioxide (CO_2) emitting sources. In June 2006, EIA provided analysis of an earlier proposal along similar lines.

Proposal Summary

This proposal applies to retail electricity suppliers with sales exceeding 500,000 megawatthours. Smaller suppliers, accounting for 270 billion kilowatthours (7 percent) of electricity sales in 2005, are exempt.

Covered retail electricity suppliers must submit to the Secretary of Energy clean energy credits in proportion to their total electricity sales. For each retail supplier, the number of clean energy credits required is either the specified share of sales during each phase of the program or the growth in electricity sales above their baseline, whichever is smaller. For example, if the share required were 20 percent in a particular year, but a retail electricity suppliers sales had only increased ten percent above its baseline sales, its required share would be limited to ten percent. Each retail electricity seller's baseline is its average annual sales during the 2008 to 2011 period.

Suppliers earn clean energy credits for renewable electricity generation, generation from fossil plants employing CO_2 capture and storage, new nuclear generation, and a limited amount of biologic sequestration. Electricity generated from solar thermal, photovoltaic, wind, ocean, geothermal, biomass, solid waste, landfill gas, and incremental hydropower technologies is counted as clean energy and is eligible to receive full compliance credits. Coal and natural gas plants that capture and transport their CO_2 emissions to permanent underground storage formations receive credits in proportion to their total CO_2 emissions. For example, a coal integrated gasification combined cycle (IGCC) plant capturing 90 percent of its carbon emissions receive 9/10 of a credit for each kilowatthour of electricity generated. Electric generation from new nuclear plants receives credits at the rate of one-half credit per kilowatthour of generation. Additionally, renewable projects on Indian lands receive two credits per kilowatthour generated. Biological carbon sequestration is eligible to earn credits to meet up to ten percent of the requirement. Examples of this include carbon stored through tree plantings and forest preservation. These sequestration programs receive 1,000 credits for each metric ton of carbon dioxide stored. The proposal also allows participation in international offset programs and carbon trading markets.

Under this revised proposal, an escalating percentage of total electricity sales must come from clean energy generation beginning in 2015. The required share of clean energy generation as a percentage of sales is:

2015-2019	10 percent
2020-2024	15 percent
2025 and thereafter	20 percent

The final requirements of this plan do not expire, unlike the previous proposal, which contained a 2030 sunset date.

Retail electricity suppliers are able to earn credits for future use by generating power with qualifying resources prior to the beginning of the program in 2015. Electricity suppliers are also free to sell, transfer, or exchange their credits. If a retail seller is not able to meet the standard, it may borrow from future anticipated credits, while submitting a plan ensuring future compliance, or it may buy credits from the program administrator. Credits purchased from the program administrator cost 2.5 cents per kilowatthour in 2005 dollars, with an adjustment for inflation.

The proposal allows credits earned from meeting State renewable portfolio standards to count towards the minimum renewable generation requirement as long as the energy meets the definition of a clean energy resource described above. Suppliers must still comply with the State renewable portfolio standard if it is more stringent than the Federal requirement. Compliance credits earned toward State requirements, including through acquisition, payment of non-compliance penalties, or the use of financial compliance mechanisms (that is, "alternative compliance payments") are valid for use in compliance with the Federal requirement. Therefore, providers may pay more than the Federal allowance market price if they fail to reach the State-mandated share of clean/renewable energy. If the State's credit requirement exceeds the Federal requirement, the retailer may transfer the excess credits to an associated company.

Implementation Issues

EIA's National Energy Modeling System (NEMS), which provides the projections in the *Annual Energy Outlook*, cannot represent all the provisions of the proposed CEPS. For example, the proposal requires the Secretary of Energy to establish rules and procedures for implementing and enforcing the requirements. This will necessitate the development of a system to establish unique sales baselines, monitor annual electricity sales growth, estimate the required level of qualifying generation, and ensure compliance for each retail electricity supplier in the country. The required qualifying sales shares may differ for each supplier because of differences in their sales growth from the baseline period. For new, merged, or divested suppliers, or suppliers whose customer base simply changes, special procedures will be required for determining the appropriate baselines and incremental annual sales growth. Given the frequency of companies' recent history of entering and leaving the retail electricity marketplace, this process could require significant effort.

In this analysis, it is assumed that all applicable suppliers' sales grow at the same average annual rate each year. Actual data, however, show that this is unlikely to occur, with some suppliers not growing and others showing negative growth. Data reported for

electricity suppliers between 2000 and 2004 show great diversity in sales growth. Moreover, electricity restructuring has increased sales volatility, causing periods of rapid negative and positive growth, which are difficult to predict. Although EIA models the requirement as the lesser of aggregate national sales growth from the baseline period and the percent of total sales on a national scale, each supplier is different. Some suppliers' sales will likely grow slowly enough that the proposed legislation will not require them to hold the share of credits as a percentage of total sales. EIA cannot predict which requirement each company will have and, therefore, takes the lesser of the average national estimates for all providers.

As noted, the proposal allows electricity suppliers to borrow clean energy credits against future compliance. Specifically, the Secretary of Energy may allow retail suppliers to borrow excess future compliance credits with submission of a plan to ensure compliance with both current and future targets up to three years into the future. The program administrator has discretion to extend the three-year borrowing limit where the plan specifies new nuclear generation as the proposed compliance option. The borrowing option is not represented in this analysis.

Model Application

EIA made several simplifying assumptions to model the proposal. Since the model does not represent individual electricity suppliers, EIA calculated a target share for aggregated electricity sales. Suppliers with aggregate annual sales less than 500,000 megawatthours would remain at the 2005 level of 270 billion kilowatthours throughout the projection period.

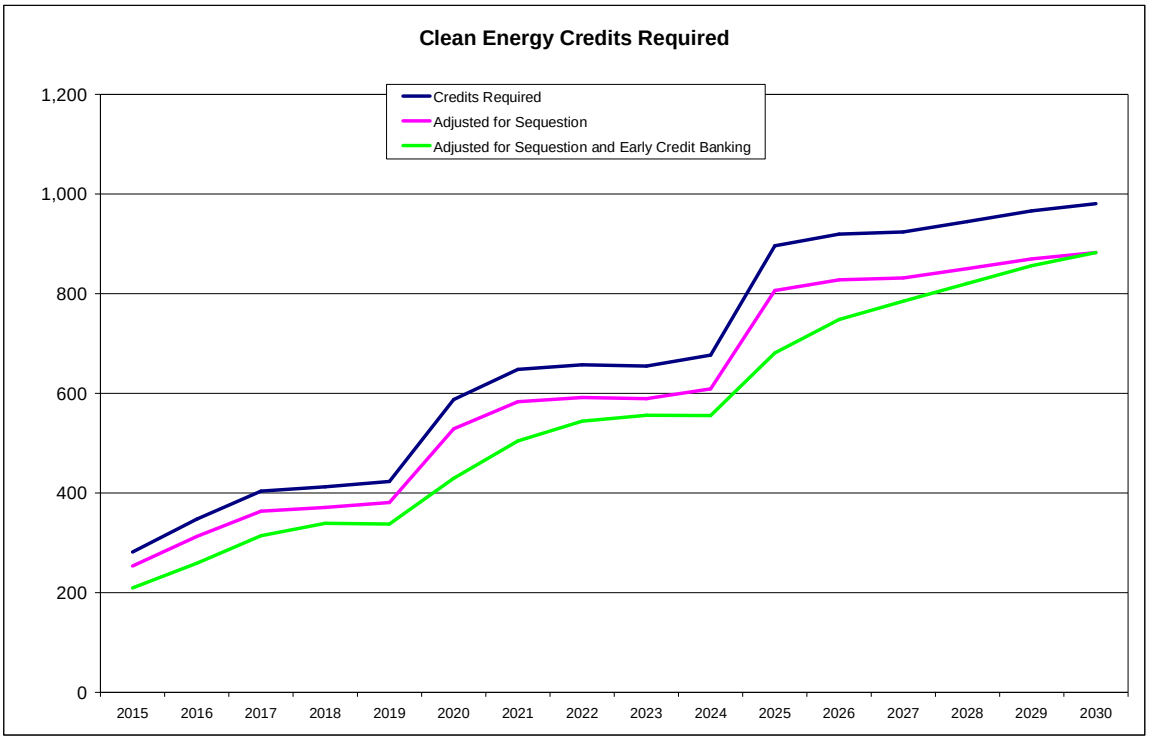
The calculated minimum renewable generation requirement share is based on the lesser of the required annual percentage share of the prior years total sales or 100 percent of sales growth from the average 2008 through 2011 baseline using the *Annual Energy Outlook 2006* reference case projections. For the first 2 years of the program, the required annual percentage share of total sales is higher than incremental sales, therefore, the requirement is limited to the sales growth relative to the baseline period.

In the early action period between 2010 and 2015, electricity suppliers have the opportunity to earn credits before the first compliance period (2015-2019) begins. A large number of credits are expected to be banked through 2015. EIA projects generation of approximately 828 billion kilowatthours of eligible power during this five-year period. This analysis assumes that suppliers use these credits to minimize compliance cost over the subsequent 15 years. It was also assumed that biological sequestration would supply the ten-percent maximum share of credits allowed by the program. Marginal abatement curves for CO_2 sequestration projects provided by the U.S. Environmental Protection Agency showed that nearly double the maximum allowable biological sequestration allocation would be available at less than half the average credit price, suggesting ample opportunities to utilize this mechanism, even given significant uncertainty in the estimates of sequestration opportunities and costs. Figure 1 shows the qualifying generation requirement used in this analysis, which assumes uniform national growth

rates, a 10-percent share accounted for by biological sequestration, and the utilization of early credits to reduce compliance costs.

Figure 1: Estimated National Target of Clean Energy Generation

(billion kilowatthours)



Source: Energy Information Administration, Office of Integrated Analysis and Forecasting

This analysis does not address the potential impacts of issuing double credits for qualifying resources developed on Indian lands. If such resources are developed, the amount of qualifying generation stimulated by the CEPS will be lower. This report also does not consider the potential development of ocean energy technologies.

This report, like other EIA analyses of clean energy and environmental policy proposals, focuses on the impacts of those proposals on energy choices made by consumers in all sectors and the implications of those decisions for the economy. This focus is consistent with EIA's statutory mission and expertise. The study does not account for any possible health or environmental benefits that might be associated with reducing emissions or the siting implications resulting from changes in electric power sector capacity expansion plans.

NEMS, like all models, is a simplified representation of reality. Projections are dependent on the data, methodologies, model structure, and assumptions used to develop them. Since many of the events that shape energy markets cannot be anticipated (including severe weather, technological breakthroughs, and geopolitical developments), energy markets are subject to significant uncertainty. Moreover, future developments in technologies, demographics, and resources cannot be foreseen with certainty.

Nevertheless, well-formulated models are useful in analyzing complex policies, because they ensure consistency in accounting and represent key interrelationships, albeit imperfectly, to provide insights.

EIA's projections are not statements of what will happen, but what might happen, given technological and demographic trends and current policies and regulations. EIA's reference case is based on current laws and regulations. Thus, it provides a policy-neutral starting point that can be used to analyze energy policy initiatives. EIA does not propose, advocate, or speculate on future legislative or regulatory changes within its reference case. Laws and regulations are generally assumed to remain as currently enacted or in force (including sunset or expiration provisions); however, the impacts of scheduled regulatory changes, when clearly defined, are reflected.

2. Energy Market Impacts of a Clean Energy Portfolio Standard

The proposed CEPS leads to extensive growth in renewable and nuclear generation. Since this proposal calls for a higher share of clean energy than the earlier proposal[4], the new generation mix further deviates from reference projections. Both renewable and nuclear energy grow more strongly with the new proposal. The expansion of these two technologies slows growth in coal and natural gas generation. As a result, carbon dioxide emissions are significantly less than in the reference case. The CEPS does raise electricity prices above those in the reference case, but only slightly (0.3 percent by 2030).

Generation and Capacity

The proposed CEPS results in changes to the fuels used for electricity generation and the mix of generating capacity added to meet growth in electricity demand. In 2030, this plan requires nearly a trillion kilowatthours of generation from qualifying sources. This is approximately double the requirements of the earlier proposal, and represents a 700-billion kilowatthour increase in qualifying generation compared to the reference case projections in 2030. These new goals, however, are moderated by the allowed 10-percent contribution from biological sequestration projects and the use of early clean energy credits accumulated in the five-year period before mandatory program compliance begins. Therefore, after starting out at 250 billion kilowatthours in 2015 (based on the incremental sales growth from the baseline-period sales), the adjusted targets reach about 880 billion kilowatthours of sales in 2030. The required amount increases the most in 2020 and 2025, as the milestones become more stringent.

Renewable generation grows much more quickly in the CEPS case than in the reference case. Total annual generation from renewable sources in 2030, including hydropower, reaches 1,026 billion kilowatthours (Figure 2) in the CEPS case, nearly double the 560 kilowatthours projected in the reference case. The earlier proposal only resulted in 592 billion kilowatthours of renewable generation in 2030.

Total nonhydropower renewable generating capacity grows by 759 percent between 2005 and 2030 in the CEPS case. Adding new renewable generating capacity becomes the compliance option of choice for the majority of the clean energy credits required because renewable technologies receive full credits and the share targets are higher in the revised CEPS. Renewable generating capacity grows from 97 gigawatts in 2004 to 124 gigawatts in the reference case and 198 gigawatts in the CEPS case. This is especially notable since hydropower capacity, currently the largest source of renewable generation, remains essentially flat over the period at 78 gigawatts.

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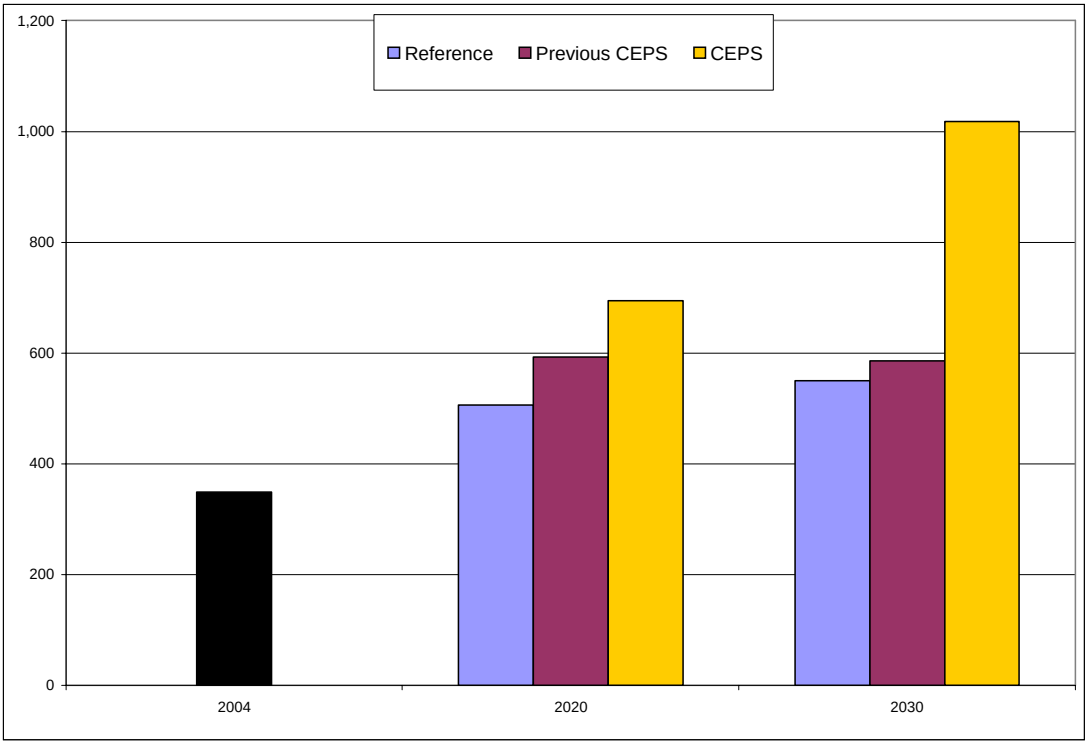
[4] Energy Information Administration, *Energy Market Impacts of a Clean Energy Portfolio Standard*, SR/OIAF/2006-02 (Washington, DC, June 2006). Web site www.eia.doe.gov//oiaf/servicerpt/emice/index.html.

Figure 2. Renewable Generation in Alternative Cases

(billion kilowatthours)



Source: National Energy Modeling System runs: AEO2006.D111905A, AEO06_COLE.D050906A, and AEO06_NWCOLES.D111606A

Electricity from biomass accounts for a large component of the growth in renewable generation. Initially, the targets are met through biomass co-firing in fossil fuel plants. In 2015, 55 billion kilowatthours of electricity come from co-firing in the CEPS case. By 2020, generation from biomass co-firing increases to 177 billion kilowatthours and it continues to rise to more than 200 billion kilowatthours over the next 2 years. Gradually, as more dedicated biomass plants come online, generation from co-firing decreases. By 2030, 126 billion kilowatthours of electricity are generated from co-firing biomass. Compared to the reference case, electricity from biomass co-firing is higher in all years. Reference case levels are 35 billion kilowatthours, 36 billion kilowatthours, and 26 billion kilowatthours in 2015, 2020, and 2030, respectively.

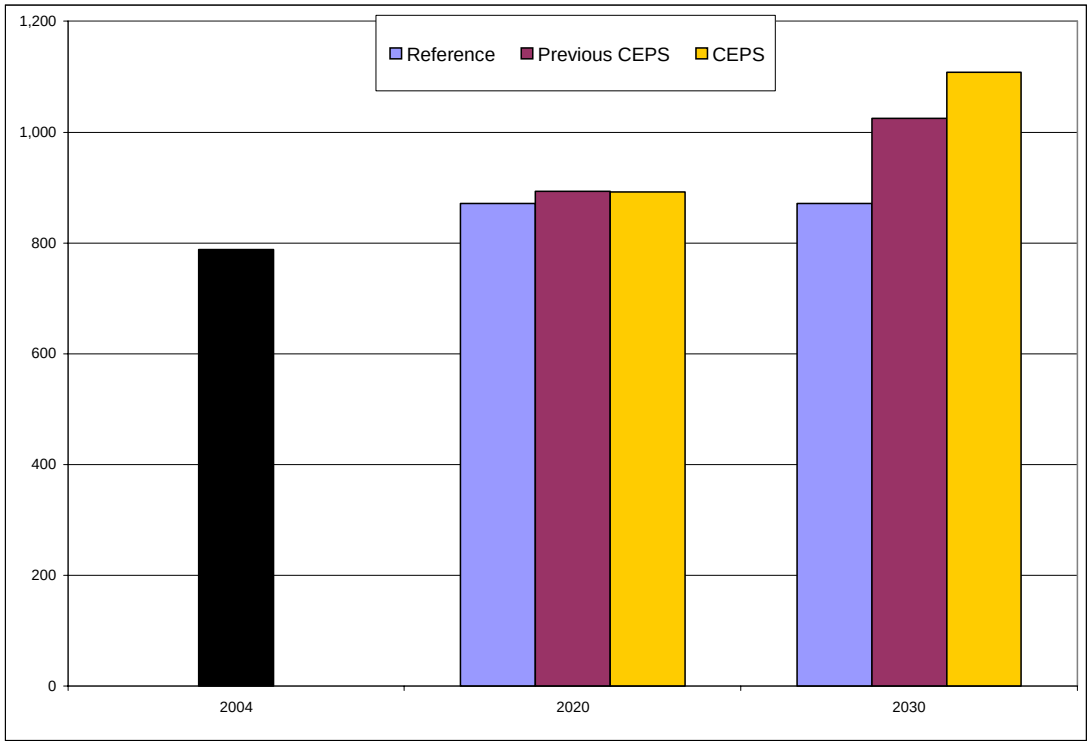
Dedicated biomass plant generation growth remains slow until the final years in the CEPS case, with the first new plants coming online in 2019. In 2015, the first year of mandatory compliance, dedicated plants generate 8 billion kilowatthours of electricity. This rises to 15 billion kilowatthours by 2020 and 78 billion kilowatthours by 2025 in the CEPS case. By 2028 in the CEPS case, dedicated biomass generation is double the 2025 levels, and it reaches 240 billion kilowatthours in 2030. The combined generation totals for dedicated and co-firing biomass facilities displace hydropower as the largest source of renewable generation in 2030 in the CEPS case. Capacity growth for dedicated plants mirrors the trend in generation. There are slightly more than 6 gigawatts of dedicated biomass facilities in 2004, and it increases slowly to nearly 8 gigawatts of capacity in

2015 in the CEPS case. However, by 2020 in the CEPS case, there are 10 gigawatts of dedicated biomass capacity, and by 2030 it increases to nearly 42 gigawatts of capacity. This contrasts with the slow, steady growth of dedicated capacity in the reference case, which projects nearly 12 gigawatts of capacity by 2030.

Wind generation also grows rapidly in the CEPS case, along with growth from other renewable technologies. In the CEPS case, generation from wind, which is 14 billion kilowatthours in 2004, grows to 58 billion kilowatthours in 2015 and 210 billion kilowatthours in 2030. In the reference case, wind generation grows more slowly, reaching 65 billion kilowatthours by the end of the forecast. Wind capacity also quickly grows under the CEPS proposal, reaching 63 gigawatts in 2030, over three times the level projected in the reference case. Geothermal capacity and generation increase in the CEPS case, with nearly 8 gigawatts of capacity generating 60 billion kilowatthours of electricity in 2030. This compares to 7 gigawatts of capacity producing 53 billion kilowatthours of electricity in 2030 in the reference case.

Figure 3. Nuclear Generation in Alternative Cases

(billion kilowatthours)



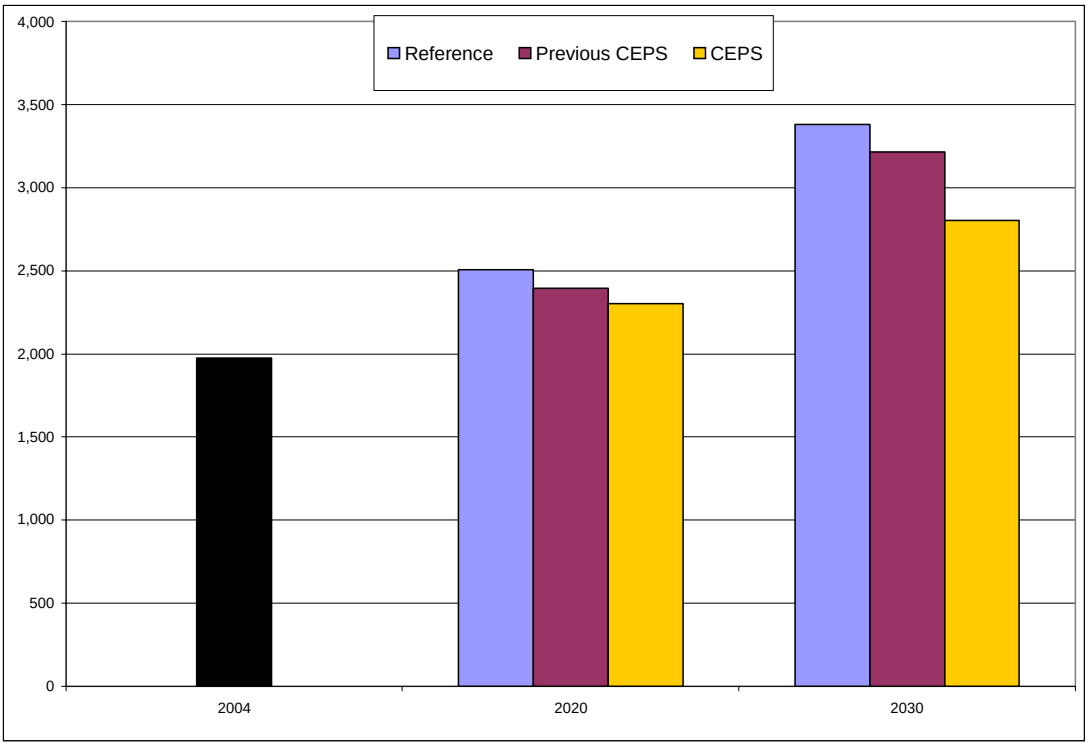
Source: National Energy Modeling System runs: AEO2006.D111905A, AEO06_COLE.D050906A, and AEO06_NWCOLES.D111606A

The CEPS is projected to lead to increased nuclear generation despite a reduction in the credit share earned in the new proposal. Unlike the previous proposal, where nuclear technologies received one full credit per unit of generation, new nuclear power stations receive one-half credit for the same amount of electricity produced under the new CEPS. Yet, because of higher required shares and resulting higher credit prices, nuclear generation increases by a larger amount. However, it no longer accounts for the majority

of qualifying sources, as it did in the earlier analysis. In the CEPS case, nuclear generation grows to 1,109 billion kilowatthours in 2030 (Figure 3). This is a 41 percent increase over 2004 levels, and 27 percent greater than the generation projected in the reference case. Moreover, generation in 2030 is 8 percent higher than the 2030 projections under the earlier CEPS proposal. In the reference case, nuclear capacity is projected to increase by 9 gigawatts between 2004 and 2030. This increase includes 3 gigawatts of capacity up-rates at existing plants and 6 gigawatts of new plant capacity. In the CEPS case, 36 gigawatts of new nuclear capacity are added by 2030, 10 gigawatts greater than under the previous proposal.

Figure 4. Coal Generation in Alternative Cases

(billion kilowatthours)



Source: National Energy Modeling System runs: AEO2006.D111905A, AEO06_COLE.D050906A, and AEO06_NWCOLES.D111606A

While coal generation still increases in the CEPS case, annual generation in 2030 is projected to be 17 percent lower than in the reference case. Coal generation grows from 1,977 billion kilowatthours of electricity in 2004, to 2,803 billion kilowatthours by 2030 in the CEPS case compared to 3,381 billion kilowatthours in the reference case (Figure 4). Annual coal generation in 2030 is 13 percent less than what was projected in the previous CEPS analysis.

In the CEPS case, coal expansion occurs much more slowly, resulting in 63 fewer gigwatts of capacity in 2030 than in the reference case projections. In the reference case forecast, coal capacity is expected to rise from 310 gigawatts in 2004 to 481 gigawatts in 2030. This growth is higher than that of all other sources, so it follows that under the

CEPS proposal the growth in eligible clean energy technologies comes largely at the expense of coal. Coal capacity grows to 418 gigawatts in 2030 in the CEPS case. While this represents 33.0 percent growth over 2004 levels, it is 13 percent less than in the reference case, and 10 percent less than the previous proposal's projections for the same year. IGCC plants with carbon sequestration, which is eligible for clean energy credits, are not economical under the proposal.

Electricity generation from petroleum and natural gas in the CEPS case shows a slight decline from reference case levels, since these fuels do not qualify for clean energy credits. While natural gas generation grows in the CEPS case, it generates 10 percent less electricity in 2030 when compared to the reference case. Natural gas combined cycle capacity is 12 gigawatts lower in the CEPS case than in the reference. While the CEPS results in slower growth in natural gas generation, it still shows an overall growth of 21 percent compared to 2004 levels.

Cost and Price Impacts

Overall, the cost and price impacts of the CEPS are small. Credit prices generally rise as the required clean generation share increases. During the first phase of the CEPS, from 2015 through 2019, credit prices range from 0.4 to 1.0 cent per kilowatthour. During the second phase of the program, from 2020 to 2024, credit prices rise, but stay below 2.0 cents per kilowatthour. Shortly after 2025, during the third phase of the program when the share required increases to 20 percent, credit prices temporarily rise to the 2.5 cent per kilowatthour price cap, but they fall over time as fossil fuel prices increase and new nuclear and renewable facilities are built. The credit price drops to 1.5 cents per kilowatthour by 2030.

The CEPS leads to higher costs for power producers. From 2006 to 2030, the cumulative incremental cost to the electric power sector of the CEPS case, in net present value terms using a seven-percent discount rate, is $7.8 billion (less than 0.5 percent of reference case industry costs).[5] These costs include such costs as material and labor for plant construction and operation, fuel, and taxes. Costs for the purchase of compliance credits are internal transfer payments within the industry (that is, one power company paying a second power company to compensate them for the second company's clean energy credits). This analysis considers credits purchased from the government as costs to the electric power sector. The primary changes to industry costs include nearly $22 billion in higher capital and fixed operations and maintenance expenditures for nuclear, wind, and biomass generating facilities from 2006 through 2030. However, $14 billion in reduced cumulative fuel and variable operating and maintenance costs caused by lower fossil fuel use and prices partially offsets these increase costs. Suppliers purchase approximately $223 million in compliance credits from the government.

Because EIA projects impacts on power industry costs to be small with respect to the reference case, consumer electricity prices and bills experience similarly small increases.

[5] All dollars in this report are 2004 dollars, cumulative calculations are discounted at 7 percent to 2006 and span from 2006 through 2030.

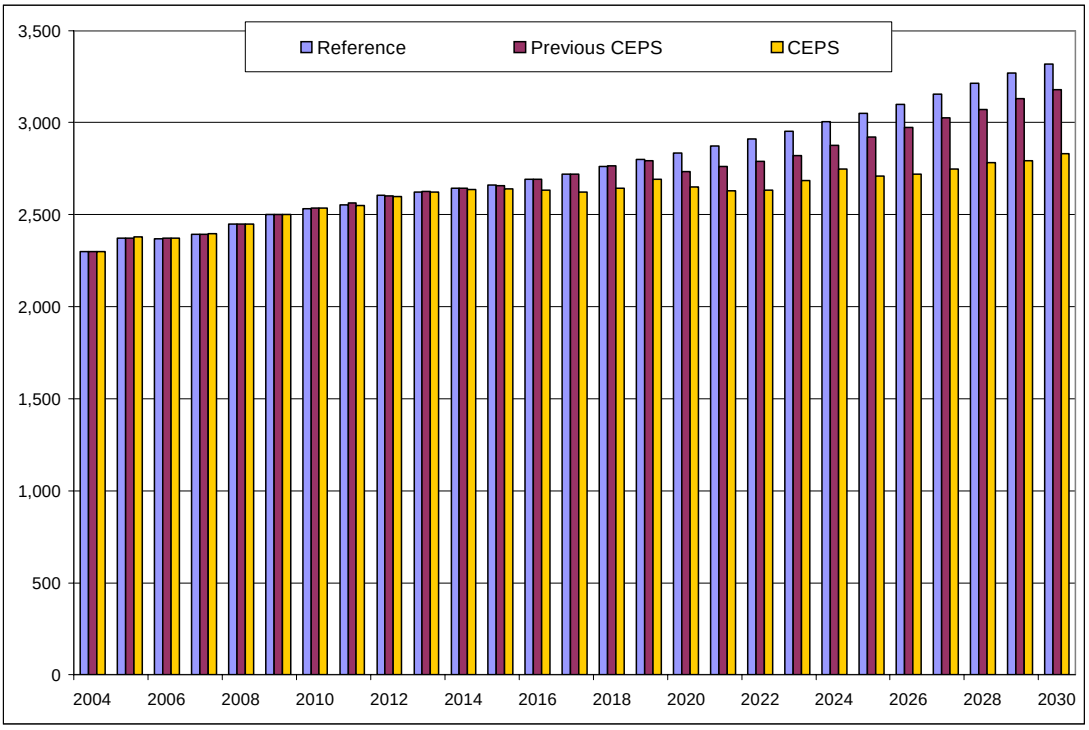
Average end-use electricity prices increase with the proposal requirements, but the impact is small and it varies over time. The largest increases are in 2020 through 2022 and in 2029, when annual electricity prices are slightly more than 1 percent (nearly 0.1 cent) above reference case levels. However, by 2030 end-use electricity prices are only 0.02 cents (0.3 percent) higher. Compared with the reference case, cumulative residential expenditures on electricity from 2006 through 2030 are $4.7 billion (2.8 percent) higher. Table 1 provides summary results for the analysis.

Emissions

The reduced use of coal and natural gas in the CEPS case lowers CO_2 emissions, particularly in the later years of the projections (Figure 5). Within the electric power sector, CO_2 emissions in 2030 are 488 million metric tons (15 percent) lower in the CEPS case than in the reference case. Over the entire projection period, cumulative emissions are 4,162 million metric tons lower (6 percent) than the reference levels. The current proposal achieves deeper cuts than the previous one, which only decreased 2030 annual emissions by 136 million metric tons. Despite this change, electricity sector CO_2 emissions in 2030 in the CEPS case are still 23 percent higher than the 2004 level. Emissions of sulfur dioxide, nitrogen oxides, and mercury are largely unchanged by the CEPS proposal. These emissions are subject to national or regional cap-and-trade regulations under the recently enacted Clean Air Interstate Rule and Clean Air Mercury Rule.

Figure 5. Power Sector Carbon Dioxide Emissions

(million metric tons)



Source: National Energy Modeling System runs: AEO2006.D111905A, AEO06_COLE.D050906A, and AEO06_NWCOLES.D111606A

Table 1. Key CEPS Analysis Results, 2020, 2025, and 2030

	2004	2020 Reference	2020 CEPS	2025 Reference	2025 CEPS	2030 Reference	2030 CEPS
Generation (billion kilowatthours)							
Coal	1,977	2,505	2,302	2,896	2,547	3,381	2,803
Petroleum	120	107	109	108	103	115	108
Natural Gas	702	1,103	1,090	1,070	968	993	889
Nuclear Power	789	871	892	871	967	871	1,109
Conventional Hydropower	269	303	302	303	302	303	302
Geothermal	14	34	37	47	55	53	60
Municipal Solid Waste/Landfill Gas	22	29	34	30	36	30	37
Dedicated Biomass	36	51	53	63	119	77	285
Biomass Co-Firing	1	36	177	29	188	26	126
Solar[A]	1	3	3	4	4	6	6
Wind	14	60	97	63	201	65	210
Total	3,955	5,108	5,104	5,492	5,498	5,926	5,944
Clean Energy Portfolio Standard Compliance							
Electricity Sales (billion kilowatthours)	3,567	4,629	4,621	4,956	4,945	5,341	5,326
Percent Clean Energy Required[B]	0.0	0.0	9.4	0.0	13.8	0.0	16.6
Generating Capacity (gigawatts)							
Coal Steam	310	345	336	390	365	457	394
Other Fossil Steam	124	80	81	79	78	75	74
Combined Cycle	159	214	208	226	215	231	218
Combustion Turbine/Diesel	130	149	150	159	160	174	174
Nuclear Power	100	109	112	109	122	109	139
Other	0	1	1	2	3	6	7
Conventional Hydropower	78	78	78	79	78	78	78
Geothermal	2	5	5	6	7	7	8
Municipal Solid Waste/Landfill Gas	3	4	5	4	5	4	5
Wood and Other Biomass	6	8	10	10	19	12	42
Solar	1	1	1	2	2	3	3
Wind	7	19	30	20	60	20	63
Total	936	1,027	1,032	1,098	1,126	1,186	1,215
Price (2004 cents per kilowatthour)							
Credit Price	0.00	0.00	1.25	0.00	1.98	0.00	1.52
Retail Electricity Price	7.6	7.2	7.3	7.4	7.4	7.5	7.5
Electric Power Sector Emissions (million metric tons)							
Carbon Dioxide	2,299	2,835	2,649	3,052	2,711	3,318	2,830
Fuel Prices							
Natural Gas Wellhead Price (2004 dollars per thousand cubic feet)	5.49	4.90	4.91	5.43	5.26	5.92	5.78
Coal Minemouth Price (2004 dollars per ton)	20.07	20.20	19.71	20.63	19.53	21.73	20.17

[A] Includes solar thermal power, utility-owned photovoltaics, and distributed photovoltaics.
[B] Incremental legislative target expressed as share of total same-year sales, accounting for exempt small retail suppliers and biological sequestration.

Source: National Energy Modeling System runs: AEO2006.D111905A and AEO06_NWCOLES.D111606A

3. Uncertainty

All long-term projections engender considerable uncertainty. It is particularly difficult to foresee how existing technologies might evolve or what new technologies might emerge as market conditions change. EIA projects that the requirements of this program can be met using existing technologies or technologies already projected to be commercially available in the reference case. However, as new clean energy technologies are developed or existing technologies are improved, these new technologies may prove more economically attractive than those technologies projected in this analysis to meet the CEPS targets. Introduction of lower-cost clean energy technologies could change the projected mix of generation resources and reduce the cost of compliance. Similarly, the cost and performance of some commercial or near-commercial clean energy technologies may not improve at the projected rates, thus allowing other technologies to gain market share and potentially raise the costs of compliance.

Several of the clean energy technologies projected to gain market share also face uncertainties with respect to resource availability and concerns over ability to site plants and dispose of generation by-products. Although the United States has witnessed extensive wind development over the past 5 years, some projects have been hampered or stopped by community objections, environmental concerns (such as for local bird or bat populations), or other siting issues. Of the extensive wind resource remaining undeveloped in the United States, it is largely unknown how much will be associated with such concerns or what the costs of mitigating these concerns might be. Similarly, nuclear plant siting may face the possibility of additional legal expenses, or local opposition, which could raise costs or limit opportunities; however, the magnitudes of these limitations are currently unknown. Additionally, nuclear power faces waste disposal issues. Several States limit the on-site storage of spent nuclear fuels and Federal efforts to commission a permanent storage site are not progressing as originally scheduled. Furthermore, approved Federal long-term storage sites only contain sufficient capacity for current facilities. These problems may be mitigated with a combination of additional spent-fuel storage capability and spent-fuel reprocessing, but the cost of either of these options is highly uncertain.

As noted in the methodology section, NEMS was not able to fully model some aspects of the policy. Provisions to award double credits for projects built on Indian lands, exempt slower-growing utilities from holding credits, and exempt retail energy suppliers with fewer than 500,000 megawatthours of annual sales will affect the actual amount of clean energy generation required under this proposal. These impacts are believed to be small, but are largely unknown.

Appendix A. Analysis Request Letter

NORM COLEMAN
MINNESOTA

COMMITTEE ON
GOVERNMENTAL AFFAIRS
CHAIRMAN
PERMANENT SUBCOMMITTEE ON INVESTIGATIONS

COMMITTEE ON
FOREIGN RELATIONS
CHAIRMAN
SUBCOMMITTEE ON
WESTERN HEMISPHERE, PEACE CORPS AND NARCOTICS AFFAIRS

COMMITTEE ON
AGRICULTURE, NUTRITION, AND FORESTRY

COMMITTEE ON
SMALL BUSINESS AND ENTREPRENEURSHIP

United States Senate
WASHINGTON, DC 20510-2307
http://coleman.senate.gov

September 12, 2006

The Honorable Guy F. Caruso
Administrator, Energy Information Administration
Department of Energy
Room 2H-027/FORS
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Mr. Caruso:

On April 24th, 2006, I submitted a request to the Energy Information Administration (EIA) for analysis of a clean energy portfolio standard (CEPS) proposal. In June, EIA released its analysis, providing valuable insight into how a clean energy portfolio standard could perform in the United States, and I have utilized that information to inform a revised, more robust CEPS.

The goal of this revised CEPS (attached) remains the formulation of legislation that will diversify electric generation fuels; reduce Clean Air Act criteria pollutants and carbon dioxide emissions; promote new electric sector technology; and encourage energy conservation through demand side management programs. This revised CEPS proposal, submitted last April, showed great promise on these fronts. EIA found electricity sector carbon dioxide emissions could be reduced at negligible cost to ratepayers and the electricity power sector. Meanwhile, the analysis showed the proposal would lessen America's reliance on natural gas through implementation of advanced energy technologies.

Building on the first analysis, the revised proposal will require each retail electric supplier (supplying more than 500,000 MWh/year) to, beginning in 2015, submit to the Secretary of Energy clean energy credits equal to a required annual percentage of its retail electric sales. This required percentage would be 10 percent in 2015-2020; 15 percent in 2020-2025; and 20 percent in 2025 and thereafter. In order to prevent slow-growing utilities from being forced to shut down existing generation to comply, a retail electric supplier's obligation would be capped at 100 percent of its load growth.

Thank you for your timely consideration of this request. If you or your staff has any questions regarding the draft legislation, please feel free to contact Tony Eberhard on my staff at (202) 224-7424.

Sincerely,

Norm Coleman

Norm Coleman
United States Senate

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Appendix B. Proposed Clean Energy Portfolio Standard

Clean Energy Portfolio Standard

SEC. —. CLEAN ENERGY PORTFOLIO.

Title VI of the Public Utility Regulatory Policies Act of 1978 is amended by adding at the end the following:

"SEC. 609. CLEAN ENERGY PORTFOLIO STANDARD.

"(a) Findings.— Congress finds that

"(1) The development of the country's clean energy resources is a high priority. A Federal clean energy portfolio standard will help improve the the nation's air quality by increasing the use of technologies to generate electricity without the production of sulfur dioxide, nitrous oxide, mercury and other emissions.

"(2) Nearly one-half of all States have implemented or are in the process of implementing programs, including Renewable Portfolio Standard ("RPS") programs, intended to diversify the mix of fuels used in the generation of electricity by requiring that a percentage of electricity sold, generated or otherwise supplied to end users be generated from designated renewable energy resources, or otherwise have programs in effect that encourage the generation of renewable or inherently clean sources of electricity.

“(3) These programs have been developed on a state-by-state basis in recognition of specific state and regional needs, interests, and resource availability.

“(4) On a national basis, the diversification of the electricity generation base will help to insure our national energy and economic security, while producing environmental improvements and advancing the introduction of new energy technologies.

“(5) Reduction of consumer demand for electricity through deployment of energy efficient technologies in the residential, business and commercial sector; implementation of demand response, smart metering and other programs that give end users tools to reduce energy consumption; and greater use of on site generating technologies, including solar, photovoltaic, combined heat and power, and fuel cells, also will contribute to national energy and economic security, environmental improvement and market opportunities for advanced technologies.

“(6) A clean energy portfolio standard can help diversify fuel sources used for electricity generation, encourage conservation, promote renewable generation resources, and significantly reduce future CO2 emissions.

“(7) The proliferation of various state programs addressing carbon emissions from the electric generation sector threatens efficiencies, generation fuel diversification and consumer electricity prices.

“(8) To ensure the most effective use of existing resources and facilities,and to ensure that a signficant portion of the increased future demand

for electricity is served by clean energy resources, a Federal clean energy porfolio standard should be applied to the a retail electric supplier's total electric sales to consumers.

"(b) Minimum Renewable Generation Requirement.— For each calendar year beginning in calendar year 2015,each retail electric supplier shall submit to the Secretary, not later than April 1 of the following calendar year, clean energy credits in an amount equal to the required annual percentage specified in subsection (c) of the retail electric supplier's total retail electric sales, except that a retail electric supplier shall not be required to submit clean energy credits in an amount greater than its incremental electric sales to electric consumers in excess of the retail electric supplier's base amount.

"(c) Required Annual Percentage.— The required annual percentage submitted in a calendar year shall be not less than the amount specified in the following table:

Calendar year:	**Minimum annual percentage**
2015-2019	10%
2020-2024	15%
2025 and thereafter	20%

"(d) Clean Energy Credits.— (1) A retail electric supplier may satisfy the requirements of subsection (b) through the submission of clean energy credits--

"(A) issued to the retail electric supplier under subsections (e) and (g);

"(B) obtained by purchase or exchange under subsection (f);

"(C) borrowed under subsection (h); or

“(D) purchased from the Secretary under subsection (i).

“(2) No more than 10% of a retail electric supplier’s obligation under subsection (b) may be satisfied through use of credits issued under subsection (e)(3)(B) (credits associated with sequestration or retrofit technologies).

"(3) A clean energy credit may be counted toward compliance with subsection (b) only once.

"(e) Issuance of Credits.— (1) The Secretary shall establish by rule, not later than 1 year after the date of enactment of this section, a program to issue, monitor the sale or exchange of, and track clean energy credits.

"(2) Under the program established under this section, an entity that generates electric energy through the use of a clean energy resource may apply to the Secretary for the issuance of clean energy credits. If the electricity is generated outside the United States, the applicant must demonstrate to the Secretary that the electricity is sold for ultimate consumption in the United States. The application shall indicate--

"(A) the type of clean energy resource used to produce the electricity,

"(B) the location where the electric energy was produced, and

"(C) any other information the Secretary determines to be appropriate.

"(3)(A) Except as provided in the subparagraphs that follow, the Secretary shall issue annually to each entity that generates electric energy one clean energy credit for each kilowatt hour of electric energy the entity generated in the prior calendar year through the use of clean energy.

“(B) The Secretary shall establish by rule, within one year after the date of enactment, a program for verifying the reduction of CO2 emissions into the atmosphere through permanent geological sequestration, bio-sequestration or through other verifiably permanent reductions in CO2 emissions from the retrofit of existing power plants with technology that permanently reduces CO2 emissions as related to net power output of the existing power plant or from the permanent reduction in CO2 emissions from industrial or other sources. The Secretary shall issue 1,000 credits for each ton of CO2 that has been verifiably and permanently sequestered, reduced or that verifiably has been sequestered through bio-sequestration. Credits issued under this subparagraph shall have the same value as credits issued under any other subparagraph of this subsection and may be used for purposes of complying with the minimum generation requirements under subsections (b) and (c) of this section, except as provided in subsection (d)(2). Projects eligible under this section shall include bio sequestration or other offset projects located outside the United States or verifiable carbon dioxide reductions obtained through international carbon dioxide trading markets.

"(C) The Secretary shall issue two clean energy credits for each kilowatt hour of electric energy generated and supplied to the grid in the prior calendar

year through the use of clean energy at a facility located on Indian land. For purposes of this paragraph, clean energy generated by biomass cofired with other fuels is eligible for two credits only if the biomass was grown on such land.

"(D) In the case of a retail electric supplier that is subject to a State renewable standard program that requires the generation or purchase of electricity from renewable energy; provides for alternative compliance payments in satisfaction of applicable State requirements under the program; provides for compliance through the acquisition of certificates or credits; provides for other financial compliance mechanisms; or imposes a penalty in the event of a failure to meet applicable requirements, the Secretary shall issue clean energy credits in an amount that corresponds to the kilowatt-hour obligation represented by the State alternative compliance payment, other financial compliance payment or penalty payment as though that payment had been made to the Secretary under subsection (i).

Such clean energy credits may be applied against the retail electric supplier's own required annual percentage under subsection (b) or may be transferred for use only by an associate company of the retail electric supplier. For purposes of this subsection, “associate company” shall have the meaning in Section 1262 of the Public Utility Holding Company Act of 2005.

“(E) In the case of a retail electric supplier that meets the criteria under subsections (n) (5) and (6), the Secretary shall issue clean energy credits in an amount that corresponds to the amount of expenditures on eligible demand side management products or services as though those expenditures had been

payments made to the Secretary under subsection (i). Such clean energy credits may be applied against the retail electric supplier's own required annual percentage or may be transferred for use only by an associate company of the retail electric supplier.

"(F) In the case of a new nuclear power facility qualifying as an inherently low emissions facility, the Secretary shall issue ½ credit for each kilowatt hour of production.

"(G) To be eligible for a clean energy credit, the unit of electric energy generated through the use of a clean energy resource must be either sold or used by the generator. If both a clean energy resource and a non-clean energy resource are used to generate the electric energy, the Secretary shall issue clean energy credits based on the proportion of the clean energy resources used. The Secretary shall identify clean energy credits by type and year of generation.

"(H) When a generator sells electric energy generated through the use of a clean energy resource to a retail electric supplier under a contract subject to section 210 of this Act or pursuant to a State net metering program, the retail electric supplier shall be treated as the generator of the electric energy for the purposes of this section for the duration of the contract.

"(I) The Secretary shall issue clean energy credits for electricity generated by an integrated gasification combined cycle generation facility or other generation facility that provides for carbon capture and sequestration in proportion to the fraction of carbon dioxide captured and sequestered. The Secretary shall calculate the amount of clean energy credits issued to such

facility by multiplying the kilowatt hours generated by the facility and supplied to the grid during the prior year by the ratio of the amount of carbon dioxide captured from the facility and sequestered to the sum of the amount of carbon dioxide captured from the facility and sequestered plus the amount of carbon dioxide emitted from the facility during the same year. Clean energy credits issued under this subsection are not subject to the limits set forth in subsection (d)(2).

"(f) Clean Energy Credit Trading.— A clean energy credit may be sold, transferred or exchanged by the entity to whom issued or by any other entity who acquires the renewable energy credit, except for those clean energy credits issued pursuant to subsections (e)(3)(D) and (E). A clean energy credit for any year that is not used to satisfy the minimum renewable generation requirement of subsection (b) for that year may be carried forward for use within any subsequent year.

"(g) Early Action.-- A retail electric supplier generating electric energy through the use of a clean energy resource (except for an inherently low emissions facility), at any time after 2009 and before 2015, is eligible to receive credits from the Secretary, and the Secretary is directed to issue such credits, on the same basis as if the generation occurred in 2015 or thereafter. Such credits shall have the same value and may be used for any purpose authorized under this section.

"(h) Clean Energy Credit Borrowing.— At any time before the end of calendar year 2015 and any subsequent calendar year, a retail electric supplier

that has reason to believe it will not have sufficient clean energy credits to comply with subsection (b) may --

"(1) submit a plan to the Secretary demonstrating that the retail electric supplier will earn sufficient credits within the next 3 calendar years (or longer if the retail electric supplier intends to obtain credits for new nuclear power) which, when taken into account, will enable the retail electric supplier's to meet the requirements of subsection (b) for calendar year 2015 and the subsequent calendar years involved; and

"(2) upon the approval of the plan by the Secretary, apply clean energy credits that the plan demonstrates will be earned within the next 3 calendar years (or longer if the retail electric supplier intends to obtain credits for new nuclear power) to meet the requirements of subsection (b) for each calendar year involved.

"(i) Credit Cost Cap.— The Secretary shall offer clean energy credits for sale at 2.5 cents per kilowatt-hour beginning in 2015 and shall offer credits for sale in subsequent years at the same price after adjusting for inflation.

"(j) Enforcement.— The Secretary may assess a civil penalty on a retail electric supplier that does not comply with subsection (b), unless the retail electric supplier was unable to comply with subsection (b) for reasons outside of the supplier's reasonable control (including weather-related damage, mechanical failure, lack of transmission capacity or availability, strikes, lockouts, or actions of a governmental authority). A retail electric supplier who does not submit the required number of clean energy credits under subsection (b) shall be subject to

a civil penalty of not more 200 percent of the average market value of credits for the compliance period for each clean energy credit not submitted.

"(k) Information Collection.— The Secretary may collect the information necessary to verify and audit--

"(1) the annual electric energy generation and clean energy generation of any entity applying for clean energy credits under this section,

"(2) the validity of clean energy credits submitted by a retail electric supplier to the Secretary, and

"(3) the quantity of electricity sales of all retail electric suppliers.

"(l) Environmental Savings Clause.— Qualified hydropower production shall be subject to all applicable environmental laws and licensing and regulatory requirements.

"(m) Existing Programs.— (1) State Savings Clause.--This section does not preclude a State from imposing additional clean energy requirements in that State, including specifying eligible technologies under such State requirements.

“(2) Coordination. --In the rule establishing this program, the Secretary shall incorporate common elements of existing clean energy programs, including state programs, to ensure administrative efficiency, market liquidity and effective enforcement. The Secretary shall work with the States to minimize administrative burdens and costs and to avoid duplicating compliance charges to retail electric suppliers.

"(n) Definitions.— For purposes of this section:

"(1) Biomass.--The term `biomass' means any organic material that is available on a renewable or recurring basis, including dedicated energy crops, trees grown for energy production, wood waste and wood residues, plants (including aquatic plants, grasses, and agricultural crops), residues, fibers, animal wastes and other organic waste materials, and fats and oils, except that with respect to material removed from National Forest System lands the term includes only organic material from --

"(A) thinnings from trees that are less than 12 inches in diameter;

"(B) slash;

"(C) brush; and

"(D) mill residues.

“(2) Bio-sequestration.- The term ‘bio-sequestration’ means the capture and storage of carbon in biological organisms.

"(3) Clean energy.--The term `clean energy' means electric energy generated by a clean energy resource.

"(4) Clean energy resource.--The term `clean energy resource' means solar (including solar water heating), wind, ocean, or geothermal energy, fuel cells (including zero emission regenerative fuel cell technology), biomass, solid waste (as defined in the Solid Waste disposal Act, 42 U.S.C. sec. 6901 et seq.), landfill gas, qualified hydropower production, as defined in section 45 (c)(8) of the Internal Revenue Code or an inherently low emissions facility.

“(5) Demand side management.- The term ‘demand side management’ means management of customer consumption of electricity or the demand for

electricity through the implementation of energy efficiency technologies, management practices or other measures relating to residential, commercial, industrial, institutional or government customers that reduce electricity consumption by those customers or industrial by-product technologies consisting of the use of a by-product from an industrial process, including the reuse of energy from exhaust gasses or other manufacturing by-products that are used in the direct production of electricity at the facility of a customer. Such term shall also include –

"(A) distributed generation technologies, including on-site renewable energy systems and fuel cells;

"(B) energy efficiency technologies, including generation technologies to improve efficiency and grid technologies to reduce line losses and otherwise improve transmission efficiency; and

"(C) demand management techniques or processes.

"(6) Expenditures on eligible demand side management products or services.- The term 'expenditures on eligible demand side management products or services' means expenditures incurred, including administration and overhead costs, for demand side management measures offered by a retail electric supplier pursuant to energy conservation, efficiency and/or demand side management plans and programs established under state law or regulation and approved by the appropriate state regulatory authorities.

"(7) Indian land.--The term `Indian land' means--

"(A) any land within the limits of any Indian reservation, pueblo, or rancheria,

"(B) any land not within the limits of any Indian reservation, pueblo, or rancheria title to which was on the date of enactment of this paragraph either held by the United States for the benefit of any Indian tribe or individual or held by any Indian tribe or individual subject to restriction by the United States against alienation,

"(C) any dependent Indian community, and

"(D) any land conveyed to any Alaska Native corporation under the Alaska Native Claims Settlement Act.

"(8) Indian tribe.--The term `Indian tribe' means any Indian tribe, band, nation, or other organized group or community, including any Alaskan Native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act (43 U.S.C. 1601 et seq.), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

“(9) Inherently low emissions facility. The term ‘inherently low emissions facility’ means an integrated gasification combined cycle generation facility or other generation technology that provides for carbon capture and sequestration, or a new nuclear power facility.

“(10) New nuclear power. The term ‘new nuclear power’ means electric energy that is generated from a nuclear facility placed in service after January 1, 2015.

"(11) Retail electric supplier.--The term `retail electric supplier' means a person or entity that sold not less than 500,000 megawatt hours of electric energy to electric consumers for purposes other than resale in any calendar year before January 1, 2015, and a person or entity that first sold electric energy to electric consumers for purposes other than resale after January 1, 2015.

"(12) Retail electric supplier's base amount.--The term `retail electric supplier's base amount' means the average annual amount of electric energy sold by the retail electric supplier to electric consumers for purposes other than resale, expressed in terms of kilowatt hours, during calendar years 2008 to 2011 or as otherwise determined by the Secretary. The Secretary shall issue rules within two years of enactment of this Act to establish the calculation of the base amount for retail electric suppliers that initiate sales after January 1, 2010, and how adjustments will be made for material changes in marketing patterns or other unusual circumstances in or since the base period.

"(13) Retail electric supplier's incremental electric sales. The term 'retail electric supplier's incremental electric sales' means the difference between a retail electric supplier's sales to electric consumers in a given year and the retail electric supplier's base amount.

"(14) Retail electric supplier's total retail sales. The term "retail electric supplier's total retail sales" means the total sales made to consumers in the previous calendar year by a retail supplier but excluding sales associated with electricity generated by a hydro-electric facility (but excluding qualified hydropower production as defined by section 45 (c)(8) of the Internal Revenue Code).

"(o) Recovery of Costs.— Any costs that will be incurred by a retail electric supplier in order to comply with the requirements of this section shall be deemed necessary and reasonable costs and shall be fully and contemporaneously recoverable in all jurisdictions. Costs necessary to comply with this section include, but are not limited to, the costs of purchase of clean energy credits and any associated energy, the costs of generation of clean energy credits, and the costs of firming, shaping, balancing, backup and delivery services prudently incurred to maintain a reliable and well-functioning electric

system that incorporates energy from clean energy resources. A retail electric supplier whose sales of electric energy are subject to any form of rate regulation, including any utility whose rates are regulated by the Commission and any State regulated electric utility, shall not be denied the opportunity to recover the full amount of the prudently incurred incremental cost of energy obtained to comply with the requirements of subsection (b) for sales to electric customers which are subject to any form of rate regulation, notwithstanding any other law, regulation, rule, administrative order or any agreement between the electric utility and either the Commission or a State regulatory authority. For the purpose of this subsection, the term `incremental cost of energy' means--

"(1) the cost to the electric utility for the purchase of energy associated with the acquisiton of clean energy credits or for the generation of energy to satisfy the minimum clean energy generation requirement of subsection (b), including any costs incurred by the electric utility to receive such energy on its system and deliver such energy to its retail loads either over existing transmission facilities or newly constructed transmission facilities. Receipt and delivery costs include transmission and distribution costs or charges, any losses and associated ancillary service charges assessed by any applicable transmission provider or provided for pursuant to an electric utility's own Commission-accepted open access transmission tariff, and any firming, shaping, backup or delivery services necessary to balance clean energy; and

"(2) the cost to the electric utility for acquiring renewable energy credits to satisfy the minimum clean energy- generation requirement of subsection (b),

including the costs for alternative compliance payments, credit or certificate purchases and other financial compliance payments made to states.

“(p) Program Review.— The Secretary shall conduct a comprehensive evaluation of all aspects of the Clean Energy Standard program within 10 years of enactment of this section and every 5 years thereafter. The study shall include an evaluation of --

“(1) The effectiveness of the program in increasing the market penetration and lower the cost of the eligible renewable technologies,

“(2) The opportunities for any additional technologies emerging since enactment of this section,

“(3) The impact on the regional diversity and reliability of supply sources, including the power quality benefits of distributed generation,

“(4) The regional resource development relative to renewable potential and reasons for any under investment in renewable resources,

“(5) The net cost/benefit of the clean energy standard to the national and state economies, including retail power costs, economic development benefits of investment, avoided costs related to environmental and congestion mitigation investments that would otherwise have been required, impact on natural gas demand and price, effectiveness of green marketing programs at reducing the cost of renewable resources, and

“(6) The flexibility granted to any State under subsection (r).

The Secretary shall transmit the results of the program review and any recommendations for modifications and improvements to the program to Congress not later than January 1, 2019.

"(q) Program Improvements.— Using the results of the review under subsection (p), the Secretary shall by rule, within 6 months of the completion of the review, make such modifications to the program as may be necessary to improve the efficiency of the program and maximize the use of clean energy under the program. In making such rule, the Secretary shall be authorized to expand the definition of clean energy resource in subsection (m)(4) or inherently low emissions facility in subsection (m)(10) to include new technologies the Secretary determines have characteristics in common with other energy resources listed in those subsections.

"(r) State Flexibility.— Within one year of enactment of this Section, any State that has reason to believe that the cost of complying with the requirements of this section shall cause undue economic hardship to the ultimate purchasers of electricity in that State, including manufacturing and industrial users of electricity, may petition the Secretary to grant a waiver from the requirements of this section for retail electric suppliers selling electricity to end use customers in that State. The Secretary shall grant such a waiver if he finds that the requirements of this section are likely to cause undue economic hardship to ultimate purchasers of electricity in that State. In making a determination on a State petition under this paragraph, the Secretary shall take into account (a) the adequacy of commercially available clean energy resources within the State, (b)

the potential clean energy resources available within the region and (c) the cost of developing those resources at current and reasonably expected levels of technology, including the cost and availability of existing and needed transmission facilities to transmit electric energy from such clean energy resources to customers within the State, and (d) the economic and related impacts of such costs on ultimate purchasers within the State.