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Energy Market Impacts of a Clean Energy Portfolio Standard

June 2006

Energy Information Administration
Office of Integrated Analysis and Forecasting
U.S. Department of Energy
Washington, DC 20585

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.

This report was prepared by the EIA Office of Integrated Analysis and Forecasting. General questions concerning the report can be directed to John J. Conti (john.conti@eia.doe.gov, 202/586-2222), Director of the Office of Integrated Analysis and Forecasting, and J. Alan Beamon (joseph.beamon@eia.doe.gov, 202/586-2025), Director of its Coal and Electric Power Division. Specific questions about the report can be directed to the following analysts:

Renewable.....Chris Namovicz (cnamovicz@eia.doe.gov, 202/586-7120)
Renewable.....Robert Smith (robert.smith@eia.doe.gov, 202/586-9413)
Electricity Modeling .....Jeff Jones (jjones@eia.doe.gov, 202/586-2038)

For ordering information and questions on other energy statistics available from EIA, please contact EIA's National Energy Information Center at:

National Energy Information Center, EI 30
Energy Information Administration
Forrestal Building
Washington, DC 20585

Telephone: 202/586-8800
TTY: 202/586-1181
FAX: 202/586-0727
E-mail: infoctr@eia.doe.gov
World Wide Web Site: http://www.eia.doe.gov/
FTP Site: ftp://ftp.eia.doe.gov/

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Executive Summary

This report responds to a request from Senator Norm Coleman that the Energy Information Administration (EIA) analyze a proposed clean energy resources policy. The proposal, a copy of which is provided in Appendix B, requires retail electric suppliers to account for an increasing fraction of incremental sales growth with clean energy resources, including nonhydro renewable resources, new hydroelectric or nuclear resources, fuel cells, or an integrated gasification combined-cycle plant that sequesters its carbon emissions. Electric suppliers may also comply by purchasing tradable clean energy generation credits from other generators or by purchasing credits from the Federal government at a clean energy credit price of 2 cents per kilowatthour. Irrespective of the incremental target over the 3-year baseline sales period, suppliers are not required to hold credits in excess of 10 percent of their total prior-year sales in any year. Electric suppliers with less than 500,000 megawatthours of sales are exempt from the requirements. This analysis is based on the reference case from the Annual Energy Outlook 2006.

The key findings include:

- In aggregate, through 2019, the proposal does not induce any significant carbon-free generation above reference case levels because enough qualifying resources are built in the reference case to meet the Clean Energy Portfolio Standard (CEPS) targets. Reference case growth in renewable and nuclear generation is large enough to comply with the targets in those years. Sixty percent of the required clean energy generation in 2030 is achieved in the reference case.
- In the last 10 years of the projections, additional nuclear and renewable generation is stimulated, and the clean energy target levels are achieved without the purchase of government-issued clean energy credits.
- In 2020 CEPS credits are projected to begin trading at just below 1 cent (2004 dollars) per kilowatthour. Over the next few years, the credit price hovers just above 1 cent per kilowatthour before declining to between 0.3 and 0.5 cents per kilowatthour in the last 5 years of the projections as competing fossil fuel prices rise.
- Almost 43 percent of the qualifying generation in 2030 is from new nuclear facilities (210 billion kilowatthours out of a requirement of 489 billion kilowatthours). Biomass (118 billion kilowatthours) and wind (90 billion kilowatthours) also provide substantial compliance generation. Other compliance generation comes from geothermal (42 billion kilowatthours), landfill gas (33 billion kilowatthours), and solar (6 billion kilowatthours).
- The increase in carbon-free generation leads to lower coal and natural gas generation. By 2030, coal generation is reduced by over 5 percent, and natural gas generation is reduced by 2 percent from their respective reference case levels.
- By 2030, the CEPS induces an additional 20 gigawatts (GW) of nuclear capacity and 7 GW of wind, along with smaller increases in biomass co-firing and landfill gas over the 2030 reference case levels. This additional capacity replaces 20 GW of coal capacity growth, as well as lesser amounts of natural gas and dedicated biomass capacity.

- From 2006 to 2030, the CEPS has a cumulative total cost to the electric power sector of about $1.2 billion (all dollars are 2004 dollars and cumulative calculations are discounted at 7 percent to 2006). This is less than 0.1 percent of cumulative industry costs in the reference case. These costs include additional capital and fixed annual expenditures of almost $9 billion, which are nearly offset by $7.8 billion in lower fuel and variable costs.
- Compared with the reference case, cumulative residential expenditures on electricity from 2006 through 2030 are $480 million (0.03 percent) higher.
- Total electricity sector carbon dioxide emissions are reduced by 136 million metric tons (4.1 percent) relative to the reference case in 2030.

Table E-S1. Key CEPS Analysis Results, 2010, 2020, 2030

	2004	2010		2020		2030	
		REF	CEPS	REF	CEPS	REF	CEPS
Generation (billion kilowatthours)							
Coal	1977	2218	2220	2505	2401	3381	3206
Petroleum	120	105	105	107	107	115	114
Natural Gas	702	774	773	1103	1100	993	974
Nuclear Power	789	809	809	871	893	871	1033
Pumped Storage/Other	8	7	7	7	7	8	8
Conventional Hydropower	269	301	301	303	302	303	303
Geothermal	14	18	18	34	34	53	42
Municipal Solid Waste/Landfill Gas	22	27	27	29	30	30	33
Dedicated Biomass	36	42	43	51	47	77	55
Biomass Co-Firing	1	34	33	36	114	26	63
Solar[1]	1	2	2	3	3	6	6
Wind	14	51	51	60	67	65	90
Total	3955	4388	4389	5108	5106	5926	5926
Clean Energy Portfolio Standard Compliance							
Electricity Sales (billion kilowatthours)	3567	3978	3978	4629	4626	5341	5342
% Qualifying Generation	2.5	4.2	4.1	5.4	7.7	5.5	9.2
% Qualifying Credits	0.0	0.0	4.1	0.0	7.7	0.0	9.2
% Clean Energy Required[2]	0.0	0.0	0.7	0.0	7.9	0.0	9.3
Generating Capacity (gigawatts)							
Coal Steam	310	319	319	345	340	457	437
Other Fossil Steam	124	122	122	80	81	75	74
Combined Cycle	159	184	184	214	210	231	229
Combustion Turbine/Diesel	130	139	139	149	152	174	177
Nuclear Power	100	101	101	109	112	109	129
Pumped Storage	21	21	21	21	21	21	21
Other	0.0	0	0	1	1	6	6
Conventional Hydropower	78	78	78	79	78	79	79
Geothermal	2	3	3	5	5	7	5
Municipal Solid Waste/Landfill Gas	4	4	4	4	4	4	5
Wood and Other Biomass	6	7	7	9	8	12	9
Solar[1]	1	1	1	2	2	3	3
Wind	7	16	16	19	21	20	27
Total	936	988	989	1027	1027	1186	1191
Prices (2004 cents per kilowatt-hour)							
Credit Price	0.0	0.0	0.0	0.0	1.0	0.0	0.5
Retail Electricity Price	7.6	7.3	7.3	7.2	7.3	7.5	7.5
Electric Sector Emissions (Million Metric Tons)							
Carbon Dioxide	2299	2533	2535	2835	2735	3318	3182
Fuel Prices							
Natural Gas Wellhead Price (2004 dollars per thousand cubic feet)	5.49	5.03	5.03	4.90	4.89	5.92	5.89
Coal Minemouth Price (2004 dollars per ton)	20	22	22	20	20	22	21

[1]Includes solar thermal power, utility-owned photovoltaics, and distributed photovoltaics.
[2] Incremental legislative target with 10 percent prior-year limit expressed as share of total same-year sales, accounting for exempt small retail suppliers.
Source: National Energy Modeling System runs AEO2006.D111905A and AEO06_COLE.D050906A.

1. Background

This report was prepared by the Energy Information Administration (EIA), in response to an April 24, 2006, request from Senator Norm Coleman (Appendix A). Senator Coleman requested that EIA assess the impacts of a clean energy portfolio standard (CEPS). This proposal, the text of which is provided as Appendix B, would require retail electric suppliers to account for an increasing fraction of incremental sales growth with zero-carbon emission energy resources through 2030. The maximum share required from qualifying resources in any year is set to 10 percent of sales in the previous year.

Proposal Summary

The proposal requires that a specified percentage of annual incremental sales be supplied by carbon-free technologies. The baseline electricity sales for the CEPS program are the average of annual sales for each retail electric supplier over the 2005 to 2007 period. Eligible technologies include generation from existing and new nonhydro renewables (including biomass co-firing), landfill gas, new hydroelectric facilities, new nuclear facilities, fuel cells, and integrated coal gasification combined-cycle plants with carbon sequestration. Small retail electric suppliers with less than 500,000 megawatthours of sales (representing about 270 billion kilowatthours, or 7 percent of sales in 2005) are excluded from the requirement. The specified annual percentages of incremental sales over the 2005-2007 baseline that must come from qualifying sources are as follows:

2010 – 2014	10 percent
2015 – 2019	20 percent
2020 – 2024	40 percent
2025 – 2030	60 percent

However, the maximum required share of qualifying resources in a given year is limited to 10 percent of each retail supplier's sales in the prior year. Electric suppliers may comply either through owning or purchasing eligible generation, by purchasing credits from other qualifying generation sources at prevailing market prices, or by purchasing credits from the government at an inflation adjusted credit cost cap currently valued at 2 cents per kilowatthour. Qualifying resources generated on Indian Lands are worth two compliance credits for every kilowatthour of actual generation. The Secretary of Energy may also grant a waiver to retail suppliers in states with a finding of excessive compliance costs to end users. Electric suppliers are not required to hold credits after 2030.

Implementation Issues

Not all of the provisions of the proposed CEPS can be represented in EIA's National Energy Modeling System (NEMS). For example, the proposal requires the Secretary of Energy (Secretary) to establish rules and procedures for implementing and enforcing the requirements. This will require the development of a system to establish unique sales baselines, monitor sales growth year-to-year, estimate the required level of qualifying

generation, and ensure compliance for each retail supplier in the country. The required qualifying sales shares will differ for each supplier because of differences in their sales growth year to year. Special procedures will be required for determining the appropriate baselines and incremental sales growth for suppliers that are created, merged, divested, or that end operations after the program starts. Given the recent history of companies frequently entering and leaving the retail electricity marketplace, this process could require significant effort.

The proposal allows generation qualifying under a State renewable or clean energy portfolio standard to qualify under the Federal requirement (that is, both requirements may be satisfied with the same generation credit). These credits, however, may only be used by the same company (or an affiliated company) claiming them at the State level. It is not clear that credits required by a State program in excess of the Federal requirement could be traded to suppliers in other States without State CEPS requirements or with lower CEPS requirements, except where common ownership structures exist. In addition, State-issued compliance credits qualify for the Federal program as long as the generation meets the State-established criteria. Thus, generation that might not otherwise be allowable under the Federal clean energy definition, such as hydro generation from existing plants, may qualify if it meets State requirements and is used for State compliance. Some State programs allow hydroelectric generation from existing plants, frequently limited to small plants or plants meeting certain technical requirements.

The proposal also allows electric suppliers to borrow clean energy credits against future compliance. Specifically, the Secretary 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 6 years into the future. The Secretary has discretion to extend the 6-year borrowing limit where the plan specifies new nuclear generation as the proposed compliance option.

Model Application

To model the potential impacts of the policy several simplifying assumptions were made. First, EIA converted the incremental target into an annual national sales share target. Because individual supplier sales are not modeled, the share target was calculated for aggregate electricity sales. It was assumed that the aggregate sales of electric suppliers with fewer than 500,000 megawatthours in annual sales would remain at the 2004 level of 270 billion kilowatthours of total sales through 2030. Based on this assumption, the following table indicates the share of total national sales by all suppliers required each year from eligible generation.

Calculated shares are based on the lesser of the legislatively-specified share of projected incremental growth over baseline sales or 10 percent of projected total (not incremental) prior year sales from the *Annual Energy Outlook 2006*[1] reference case. Incremental hydro-electric generation is assumed to be zero.

[1] Energy Information Administration, *Annual Energy Outlook 2006*, DOE/EIA-0383(2006) (Washington, DC, February 2006). Web site www.eia.doe.gov/oiaf/aeo/index.html.

This methodology assumes that all suppliers covered by the program grow at the same average annual rate each year. However, actual data show that this is unlikely to occur, and with many electric suppliers' sales not growing at all, the shares estimated likely overstate the requirement. Data reported for 2000 through 2004 show that there was great diversity in sales growth among electric suppliers over this period. Some companies just entering the retail market showed very rapid growth, while others showed rapid sales declines. Overall, entities accounting for nearly 30 percent of sales in 2004 showed negative sales growth between 2000 and 2004. Over longer time periods, the number of retailer suppliers with little or no sales growth is likely to be smaller, but there are likely to be a significant number of companies whose sales do not grow or grow very slowly. If the electricity market continues to become increasingly competitive, there could be rapid up and down movements in the sales of any particular supplier. As a result, the national required share of qualifying generation would not likely reach the 9.3 percent share shown in Table 1 since some suppliers would not be required to participate for lack of sales growth.

Table 1. Estimated National Target for Clean Energy Share of Total Sales

Year	Percent of Total Sales
2006	0.0
2007	0.0
2008	0.0
2009	0.0
2010	0.7
2011	0.8
2012	1.0
2013	1.1
2014	1.2
2015	2.7
2016	3.0
2017	3.2
2018	3.5
2019	3.7
2020	7.9
2021	8.3
2022	8.7
2023	9.1
2024	9.2
2025	9.3
2026	9.3
2027	9.3
2028	9.3
2029	9.3
2030	9.3

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 represent the potential development of ocean energy technologies or the potential that some technologies would qualify for the program because they meet existing State program requirements.

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 curtailing greenhouse gas emissions.

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. Many of the events that shape energy markets, including severe weather, technological breakthroughs, and geopolitical developments, are subject to considerable 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 imposition of the proposed CEPS leads to increased reliance on qualifying renewable and nuclear generation. However, because 60 percent of the required qualifying generation needed in 2030 is achieved in the reference case, projected shifts in fuel use are not dramatic. The increase in nuclear and renewable generation stimulated by the CEPS is offset by lower coal and natural gas generation. While the CEPS does lead to slightly higher resource costs for electricity producers, the clean energy credit price is projected to remain below the credit price cap and the impacts on consumer electricity prices are small.

Generation and Capacity

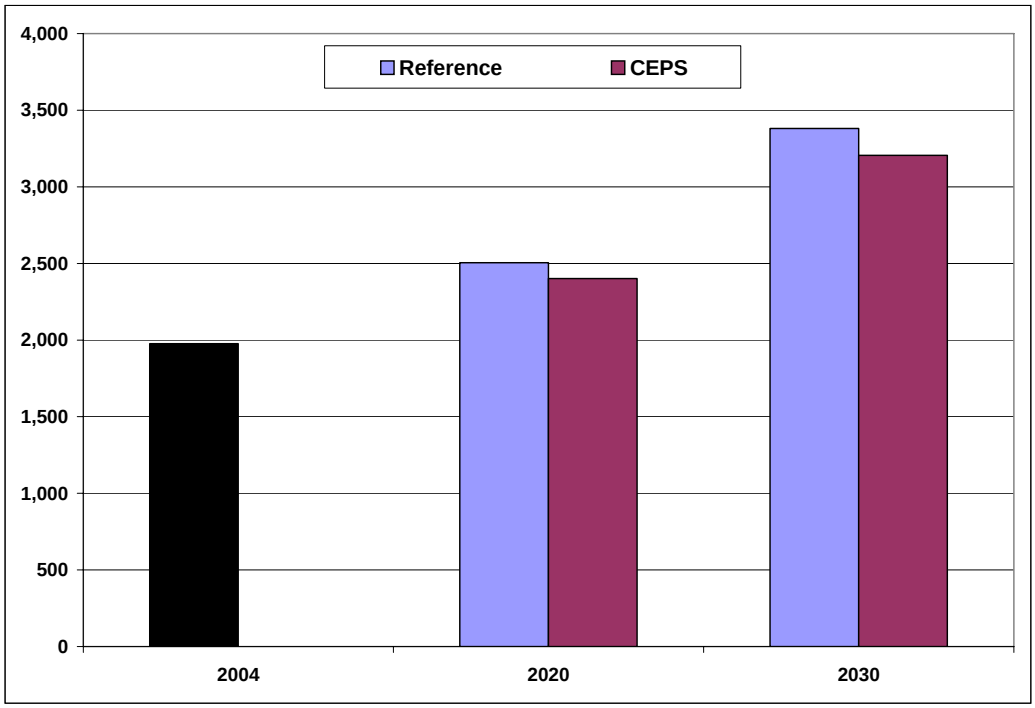
The proposed CEPS results in changes to the fuels used for electricity generation and the generation capacity added to meet growth in the electricity demand. To comply with the CEPS, approximately 500 billion kilowatthours of generation from qualifying sources is needed in 2030. In the reference case, about 300 billion kilowatthours of generation from qualifying resources is projected in 2030, so an additional 200 billion kilowatthours are needed for CEPS compliance.

While coal generation still increases under the CEPS, annual generation in 2030 is projected to be 3,206 billion kilowatthours compared to 3,381 billion kilowatthours in the reference case (Figure 1 and Table 2). Both of these values are well above the 1,977 billion kilowatthours of electricity generated from coal in 2004. However, the coal generation in the CEPS case is 5.2 percent lower by 2030 than in the reference case.

Total coal generating capacity is about 20 gigawatts (GW) lower in 2030 in the CEPS case than in the reference case. In the reference case forecast, coal capacity is expected to rise from 310 GW in 2004 to 457 GW in 2030. With the CEPS legislation, coal capacity grows more slowly, achieving 437 GW at the end of the forecast period. This is 4.4 percent less capacity than that of the reference case. No integrated gasification combined-cycle plants with carbon sequestration are added under the legislation. Nuclear and renewable facilities have lower costs than advanced coal with sequestration and are therefore used to meet the legislative requirements.

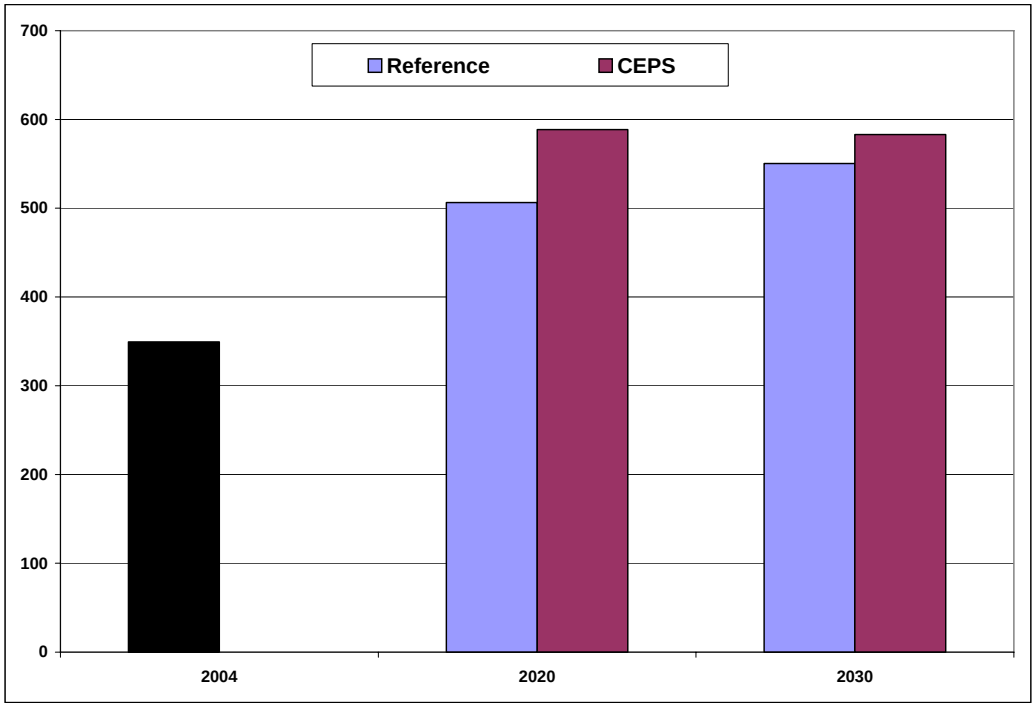
Renewable generation grows more quickly under the CEPS case than in the reference case. Total annual generation from renewable sources in 2030, including hydropower, reaches 592 billion kilowatthours in the CEPS case, compared to 560 billion kilowatthours in the reference case (Figure 2). This represents a 5.7-percent increase in renewable generation over the reference case level in 2030, and a 64-percent increase over the 2004 generation level of 360 billion kilowatthours. As in the reference case, nearly all of the renewable generation growth in the CEPS case can be attributed to increases in wind and biomass generation. Annual wind generation, which was 14.2 billion kilowatthours in 2004, grows to 65 billion kilowatthours by 2030 in the reference case and to 90 billion kilowatthours in the CEPS case.

Figure 1. Coal Generation in Alternative Cases
(billion kilowatthours)



Source: National Energy Modeling System runs: AEO2006.D111905B and AEO06_COLE.D050906A

Figure 2. Renewable Generation in Alternative Cases
(billion kilowatthours)



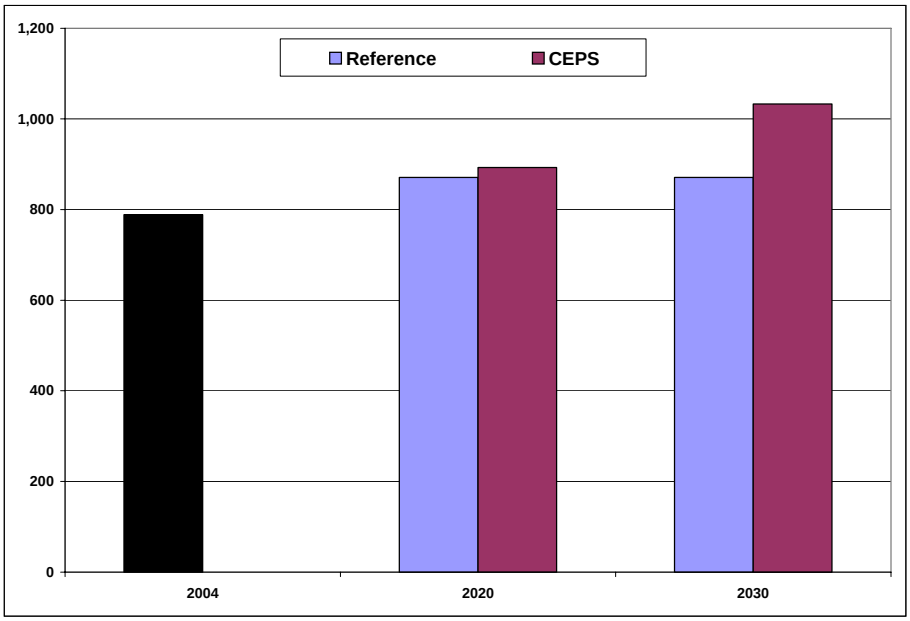
Source: National Energy Modeling System runs: AEO2006.D111905B and AEO06_COLE.D050906A

Biomass generation is also projected to be stimulated by the CEPS, but the increase comes from greater co-firing of biomass with coal rather than the addition of new dedicated biomass plants. The amount of dedicated biomass capacity added in the CEPS case is actually lower than in the reference case. This occurs because the CEPS credit improves the economics of using biomass to displace some coal use in existing coal plants, leading to higher biomass prices. This makes the addition of dedicated biomass plants less economically attractive. By 2030, total biomass generation is projected to be 117.8 billion kilowatthours, 14.9 billion kilowatthours greater than in the reference case.

Total wind capacity by 2030 increases from 7 GW in 2004 to 27 GW in the CEPS case, 7 GW greater than the 20 GW level reached in the reference case. The CEPS also raised municipal solid waste and landfill gas generation capacity above that of the reference case. While showing overall growth, the 2030 capacity levels of both geothermal and dedicated biomass were lower than the 2030 capacity in the reference case CEPS geothermal capacity was approximately 1 GW less than that of the reference in 2030, while dedicated biomass was lower by 2 GW when compared to the reference case.

The CEPS is projected to increase nuclear generation (Figure 3). In fact, new nuclear power plants account for the majority of the difference in generation from qualifying resources between the CEPS and reference cases. In the CEPS case, nuclear generation grows to 1,033 billion kilowatthours in 2030. This is a 31-percent increase over 2004 levels, and 18.7 percent greater than the generation projected for the reference case. In the reference case, nuclear capacity is projected to increase by 9 GW between 2004 and 2030. This increase includes 3 GW of capacity up-rates at existing plants and 6 GW of new plant capacity. In the CEPS case, 26 GW of new nuclear capacity are added.

Figure 3. Nuclear Generation in Alternative Cases
(billion kilowatthours)



Source: National Energy Modeling System runs: AEO2006.D111905B and AEO06_COLE.D050906A

Table 2. Key CEPS Analysis Results, 2010, 2020, 2030

	2004	2010		2020		2030	
		REF	CEPS	REF	CEPS	REF	CEPS
Generation (billion kilowatthours)							
Coal	1977	2218	2220	2505	2401	3381	3206
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Generating Capacity (gigawatts)							
Coal Steam	310	319	319	345	340	457	437
Other Fossil Steam	124	122	122	80	81	75	74
Combined Cycle	159	184	184	214	210	231	229
Combustion Turbine/Diesel	130	139	139	149	152	174	177
Nuclear Power	100	101	101	109	112	109	129
Pumped Storage	21	21	21	21	21	21	21
Other	0.0	0	0	1	1	6	6
Conventional Hydropower	78	78	78	79	78	79	79
Geothermal	2	3	3	5	5	7	5
Municipal Solid Waste/Landfill Gas	4	4	4	4	4	4	5
Wood and Other Biomass	6	7	7	9	8	12	9
Solar[1]	1	1	1	2	2	3	3
Wind	7	16	16	19	21	20	27
Total	936	988	989	1027	1027	1186	1191
Prices (2004 cents per kilowatt-hour)							
Credit Price	0.0	0.0	0.0	0.0	1.0	0.0	0.5
Retail Electricity Price	7.6	7.3	7.3	7.2	7.3	7.5	7.5
Electric Sector Emissions (Million Metric Tons)							
Carbon Dioxide	2299	2533	2535	2835	2735	3318	3182
Fuel Prices							
Natural Gas Wellhead Price (2004 dollars per thousand cubic feet)	5.49	5.03	5.03	4.90	4.89	5.92	5.89
Coal Minemouth Price (2004 dollars per ton)	20	22	22	20	20	22	21

[1]Includes solar thermal power, utility-owned photovoltaics, and distributed photovoltaics.
[2] Incremental legislative target with 10 percent prior-year limit expressed as share of total same-year sales, accounting for exempt small retail suppliers.
Source: National Energy Modeling System runs AEO2006.D111905A and AEO06_COLE.D050906A.

Cost and Price Impacts

Overall, the cost and price impacts of the CEPS are small. In fact, through 2019, there is no incremental cost because enough qualifying resources are built in the reference case to meet the CEPS targets. In 2020, CEPS credits are projected to begin trading at just below 1 cent (2004 dollars) per kilowatthour. Over the next few years, the credit price hovers just above 1 cent per kilowatt before declining to between 0.3 and 0.5 cents per kilowatthour in the last 5 years of the projections. The credit prices fall over time because rising coal and natural gas prices make it less expensive to stimulate increased generation from qualifying resources. The costs of the qualifying resources are also expected to decline as they penetrate the market and the technology matures.

The CEPS does lead to higher costs for power producers. From 2006 to 2030, the CEPS has a cumulative total cost to the electric power sector, relative to the reference case, of about $1.2 billion (less than 0.1 percent of reference case industry costs)[2]. Power sector costs include all expenditures made by the industry to non-industry entities. These 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 above-market costs for clean energy generation). Credits purchased from the government would be considered costs to the electric power sector, but no government-supplied credits are projected to be necessary to meet the requirements of the program. The primary changes to industry costs include nearly $9 billion in higher capital and fixed annual expenditures for nuclear, wind, and biomass generating facilities from 2006 through 2030. However, these increased capital costs are largely, but not entirely, offset by $7.8 billion in reduced cumulative fuel and variable operating costs.

Because impacts on power industry costs are projected to be small with respect to the reference case, consumer electricity prices and bills do not significantly change. By 2030, average retail electricity prices in the CEPS case are nearly equal to those in the reference case. Compared with the reference case, cumulative residential expenditures on electricity from 2006 through 2030 are $480 million (0.03 percent) higher.

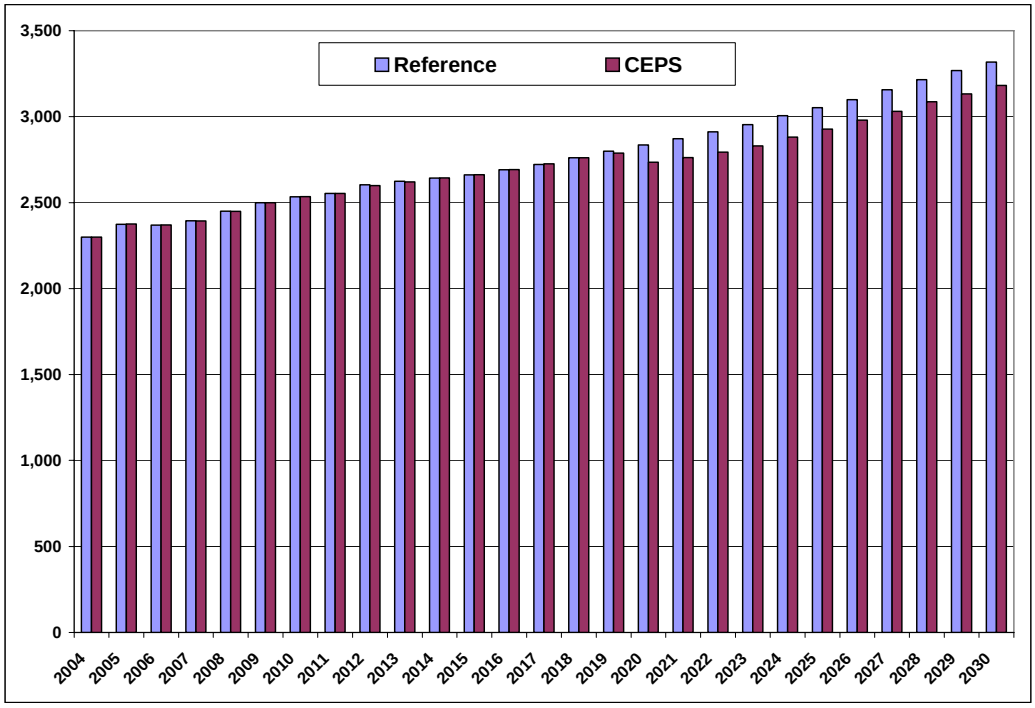
Emissions

The reduced use of coal and natural gas in the CEPS case lowers carbon dioxide (CO_2) emissions in the later years of the projections (Figure 4). Within the electric power sector, annual CO_2 emissions are 136 million metric tons (4.1 percent) lower in the CEPS case than in the reference case in 2030. Despite this change, electricity sector CO_2 emissions in 2030 are still 38.4 percent higher than the 2004 level in the CEPS case. Emissions of sulfur dioxide, nitrogen oxides, and mercury are largely unchanged by the CEPS policy. These emissions are subject to national or regional cap-and-trade

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

regulations under the recently enacted Clean Air Interstate Rule (CAIR) and Clean Air Mercury Rule (CAMR).

Figure 4. Carbon Dioxide Emissions
(million metric tons)



Source: National Energy Modeling System runs: AEO2006.D111905B and AEO06_COLE.D050906A

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. Since the requirements of this program are readily met using existing technologies or technologies already projected to be commercially available in the reference case, the CEPS by itself is not likely to require or spur development of new clean energy technologies. However, as new clean energy technologies are developed or existing technologies are improved, they may prove more economic than those technologies projected to meet the CEPS targets. Introduction of lower-cost clean energy technologies would change the projected mix of generation resources and tend to 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 raising 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 country 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, siting a nuclear plant may also face the possibility of expensive or limiting local opposition, which could raise costs or limit opportunities; however, the magnitude of these limitations are currently unknown. Nuclear also faces uncertainties associated with the cost of waste disposal. 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 Model Application 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 from holding credits for the significant share of retail energy suppliers that do not experience positive load growth in a given year, and exempt retail energy suppliers with less 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

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

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

April 24, 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:

I am writing to request your assistance in analyzing the impact on utility sector carbon emissions of legislation that I am considering introducing. It is my understanding that you previously prepared an analysis comparing Senator Bingaman's renewable portfolio standard and the National Commission on Energy Policy's carbon cap and trade proposal. It would be my hope that you would use the same model to review the impact of my draft legislation, which I have enclosed, on utility sector carbon emissions.

This draft bill is loosely modeled on the Bingaman legislation but with three major differences. First, unlike the Bingaman proposal, which obligates utilities to hold renewable credits equal to a certain amount of total utility retail sales, my proposal would impose the obligation on utility sales growth rather than total sales. This change was made in order to more fairly allocate the burden between slow and faster growing utilities. Second, because my bill calculates the utility obligation on incremental sales, the yearly percentages are much larger. Third, the draft bill expands eligible resources beyond traditional renewable resources to include IGCC with carbon capture, new nuclear facilities, and expenditures on demand side management programs.

Accordingly, the legislation is really a clean energy resources bill designed to promote the development not only of renewables but also conservation and zero carbon emissions resources. This feature also is designed to allow utilities located in areas of the country that do not have indigenous sources of renewable fuels to develop resources that are carbon free rather than simply purchase renewable credits from other parts of the country.

HART SENATE OFFICE BUILDING
SUITE 320
WASHINGTON, DC 20510-2307
TEL: (202) 224-5641
FAX: (202) 224-1152

2550 UNIVERSITY AVENUE WEST
SUITE 100N
ST. PAUL, MN 55114-1098
TEL: (651) 645-0323
FAX: (651) 645-3110

12 CIVIC CENTER PLAZA
SUITE 2167
MANKATO PLACE
MANKATO, MN 56001-7781
TEL: (507) 625-5800
FAX: (507) 625-9427

In sum, the bill is designed to address some of the criticisms that have been leveled at the Bingaman approach while remaining faithful to the objective of promoting renewable resources and new generation technologies. It is my hope that the overall impact on utility carbon emissions also will be similar.

Thank you for your assistance on this matter. 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
United States Senate

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 priority. A Federal clean energy portfolio standard will help improve the the nation's air quality by inreasing the use of technologies to generate electricity without the production of sulfur dioxide, nitrous oxide, mercury, carbon dioxide 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) 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 incremental increase in electric sales.

"(b) Minimum Renewable Generation Requirement.— For each calendar year beginning in calendar year 2010 and ending in 2030, 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 incremental electric sales, except that a retail electric supplier shall not be required to submit clean energy credits in an

amount greater than 10 percent of that supplier's total sales to electric consumers in the previous calendar year.

"(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**
2010-2014	10%
2015-2019	20%
2020-2024	40%
2025-2030	60%

"(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 subsection (e);

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

"(C) borrowed under subsection (g), or

"(D) obtained through expenditures on eligible demand side management products or services since the date of enactments.

"(2) 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 subparagraphs (B), (C), and (D), 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) For incremental hydropower the clean energy credits shall be calculated based on the increase in average annual generation resulting from the efficiency improvements or capacity additions. The number of credits shall be calculated using the same water flow information used to determine a historic average annual generation baseline for the hydroelectric facility and certified by the Secretary or the Commission. The calculation of the clean energy credits for incremental hydropower shall not be based on any operational changes at the hydroelectric facility not directly associated with the efficiency improvements or capacity additions.

"(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--

(i) represented by the State alternative compliance payment, credit or certificate payment, other financial compliance payment or penalty payment as though that payment had been made to the Secretary under subsection (h) or

(ii) satisfied under the State program through the use of an eligible technology or eligible resource as defined by the State.

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 subsection (d) (1) (D), the Secretary shall issue clean energy credits in an amount that corresponds to the amount of eligible expenditures as though those eligible

expenditures had been payments made to the Secretary under subsection (h). 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) 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 renewable energy resource and a non-renewable energy resource are used to generate the electric energy, the Secretary shall issue clean energy credits based on the proportion of the renewable energy resources used. The Secretary shall identify renewable energy credits by type and year of generation.

"(G) 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.

"(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 the next 4 years.

"**(g) Clean Energy Credit Borrowing.**— At any time before the end of calendar year 2010 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 6 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 2010 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 6 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.

"**(h) Credit Cost Cap.**— The Secretary shall offer clean energy credits for sale at the lesser of 2.0 cents per kilowatt-hour or 200 percent of the average market value of clean energy credits for the applicable compliance period.

"**(i) 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 than the lesser of 2.0 cents or 200 percent of the average market value of credits for the compliance period for each clean energy credit not submitted.

"(j) 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.

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

"(l) 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.

"(m) 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) 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.

"(3) Eligible demand side management products or services.- The term 'eligible demand side management products or services' means 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.

"(4) Incremental hydropower.--The term `incremental hydropower' means additional generation that is achieved from increased efficiency or additions of capacity that is placed in service on or after January 1, 2005 or the effective date of the applicable State renewable portfolio standard program, at a hydroelectric dam that was placed in service before that date.

"(5) 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.

"(6) 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.

"(7) Inherently low emissions facility. The term 'inherently low emissions facility' means an integrated gasification combined cycle generation facility that provides for carbon capture and sequestration or a new nuclear power facility.

"(8) New hydropower. The term 'new hydropower' mean electricity generated at a dam, resevoir or pumped storage facility that was placed in service after January 1, 2005.

"(9) New nuclear power. The term 'new nuclear power' means electric energy that is generated from a nuclear facility placed in service after January 1, 2010.

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

"(11) 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, incremental hydropower or, an inherently low emissions facility.

"(12) 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, 2005, and a person or entity that first sold electric energy to electric consumers for purposes other than resale after January 1, 2005.

"(13) 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 2005 to 2007 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, 2008, and how adjustments will be made for material changes in marketing patterns or other unusual circumstances in or since the base period.

"(14) 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.

"(n) 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. 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 transmission and the purchase or generation of energy to satisfy the minimum clean energy generation requirement of subsection (b); 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.

"(o) 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. 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 (q).

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, 2016.

"(p) Program Improvements.— Using the results of the review under subsection (o), 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, notwithstanding subsection (n)(12) to expand the definition of renewable energy resource to include new technologies the Secretary determines have characteristics in common with other renewable energy resources listed in subsection (l)(12).

(q) 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 subsection 609(a) 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 Section 609 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.

"(r) Sunset.— This section expires December 31, 2030.".