

# **Energy Market and Economic Impacts of a Proposal to Reduce Greenhouse Gas Intensity with a Cap and Trade System**

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## Executive Summary

### Background

This report responds to a request from Senators Bingaman, Landrieu, Murkowski, Specter, Salazar, and Lugar for an analysis of a proposal that would regulate emissions of greenhouse gases (GHGs) through a national allowance cap-and-trade system. Under this proposal, suppliers of fossil fuel and other covered sources of GHGs would be required to submit government-issued allowances based on the emissions of their respective products. The gases covered in this analysis of the proposal include energy-related carbon dioxide, methane from coal mining, nitrous oxide from nitric acid and adipic acid production, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.<sup>1</sup>

The program would establish annual emissions caps based on targeted reductions in greenhouse gas intensity, defined as emissions per dollar of Gross Domestic Product (GDP). The targeted reduction in GHG intensity would be 2.6 percent annually between 2012 and 2021, then increase to 3.0 percent per year beginning in 2022. To limit its potential cost, the program includes a “safety-valve” provision that allows regulated entities to pay a pre-established emissions fee in lieu of submitting an allowance. The safety-valve price is initially set at \$7 (in nominal dollars) per metric ton of carbon dioxide equivalent (MMTCO<sub>2e</sub>) in 2012 and increases each year by 5 percent over the projected rate of inflation, as measured by the projected increase in the implicit GDP price deflator. In 2004 dollars, the safety valve rises from \$5.89 in 2012 to \$14.18 in 2030.

The proposal calls for initially allocating 90 percent of the allowances for free to various affected groups, but the proportion of allowances to be auctioned grows from 10 percent in 2012 to 38 percent in 2030. The revenue from the auctions and any safety-valve payments are accumulated into a “Climate Change Trust Fund,” capped at \$50 billion, to provide incentives and pay for research, development, and deployment of technologies to reduce greenhouse gas emissions. The U.S. Treasury would retain any revenue collected in excess of the \$50-billion limit.

As specified in the request for the analysis, EIA considered both a Phased Auction case, which allocates allowances as specified in the proposal, and a Full Auction case, in which all allowances are assumed to be auctioned beginning in 2012. Because they share the same emissions targets and safety valve prices, the energy sector impacts in the Phased and Full Auction cases are very similar. The only areas where the impacts in the two cases differ are for electricity prices and the economic impacts associated with collection and use of revenue from the sale of allowances. Several additional sensitivity cases examine the impacts of higher and lower safety valves and limiting the use of emission reduction credits, or offsets, from non-covered entities. The proposal and its variants were modeled using the National Energy Modeling System and compared to the reference case projections from the *Annual Energy Outlook 2006 (AEO2006)*.<sup>2</sup>

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<sup>1</sup> Specific provisions in the bill define the covered entities and the respective gases subject to regulation more precisely; however, the emissions accounting in NEMS precludes a more detailed treatment.

<sup>2</sup> 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](http://www.eia.doe.gov/oiaf/aeo/index.html)

The analysis presented in this report builds on previous EIA analyses addressing GHG limitation, including earlier EIA reports requested by Senator Bingaman<sup>3</sup>, Senator Salazar<sup>4</sup>, and Senators Inhofe, McCain, and Lieberman.<sup>5</sup> All of the analysis cases incorporate the economic and technology assumptions used in the AEO2006 reference case. While increased expenditures for research and development (R&D) resulting from the creation of the Climate Change Trust Fund are expected to lead to some technology improvements, a statistically reliable relationship between the level of R&D spending for specific technologies and the impacts of those expenditures has not been developed. Furthermore, the impact of Federal R&D is also difficult to assess, because the levels of private sector R&D expenditures usually are unknown and often far exceed R&D spending by the Federal Government.

However, the recent reports for Senators Bingaman and Salazar include additional sensitivity analyses on the assumptions made regarding the availability of GHG emissions reductions outside the energy sector and the pace of advances in technology used to produce and consume energy. The report for Senators Inhofe, McCain, and Lieberman also examines the economic implications of possible alternative approaches to recycling revenues collected by government under a cap-and-trade program in which significant amounts of government revenue is collected from allowance auctions. Alternative assumptions in these areas can have a major impact on the results obtained, and the insights from those prior sensitivity cases would also be applicable to the proposal analyzed this report. Readers interested in how the results reported below might be affected by different assumptions in these areas are encouraged to review the earlier reports.

The modeled impacts of the proposal are summarized below. Reported results apply for the \$7 Phased Auction case, unless otherwise stated. Energy and allowance prices are reported in 2004 dollars for compatibility with *AEO2006*. Macroeconomic time series such as GDP and consumption expenditures are reported in 2000 chain-weighted dollars to maintain consistency with standard reports of U.S. economic statistics. Projections of the aggregate value of allowances and auction revenues and fiscal impacts on the budget surplus are reported in nominal dollars, as are deposits relating to the Climate Change Trust Fund.

## Results

### Emissions and Allowance Prices

- The proposal leads to lower GHG emissions than in the reference case, but the intensity reduction targets are not fully achieved after 2025. Some regulated entities would opt to make safety-valve payments beginning in 2026, the year in which the market value of allowances is projected to reach the safety-valve level (Table ES1). With the higher safety-valve prices in the \$9 Phased Auction sensitivity case, the intensity targets are attained through 2029.

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<sup>3</sup> Energy Information Administration, *Impacts of Modeled Recommendations of the National Commission on Energy Policy*, SR/OIAF/2005-02 (Washington, DC, April, 2005) web site <http://www.eia.doe.gov/oiaf/servicerpt/bingaman/index.html>

<sup>4</sup> Energy Information Administration, *Energy Market Impacts of Alternative Greenhouse Intensity Reduction Goals*, SR/OIAF/2006-01 (Washington, DC, March, 2006) web site [http://www.eia.doe.gov/oiaf/servicerpt/agg/pdf/sroiaf\(2006\)01.pdf](http://www.eia.doe.gov/oiaf/servicerpt/agg/pdf/sroiaf(2006)01.pdf)

<sup>5</sup> Energy Information Administration, *Analysis of S.139, the Climate Stewardship Act of 2003*, SR/OIAF/2003-02 (Washington, DC, June 2003) web site [http://www.eia.doe.gov/oiaf/servicerpt/ml/pdf/sroiaf\(2003\)02.pdf](http://www.eia.doe.gov/oiaf/servicerpt/ml/pdf/sroiaf(2003)02.pdf)

- Relative to the reference case, covered GHG emissions less offsets<sup>6</sup> are 562 MMTCO<sub>2</sub>e (7.4 percent) lower in 2020 and 1,259 MMTCO<sub>2</sub>e (14.4 percent) lower in 2030 in the Phased Auction case. Covered GHG emissions grow by 24 percent between 2004 and 2030, about half the increase in the reference case.
- In the early years of the program, when allowance prices are relatively low, reductions in GHG emissions outside the energy sector are the predominant source of emissions reductions. In 2020, reductions of GHGs other than energy-related CO<sub>2</sub>, estimated based on information provided by the Environmental Protection Agency, account for nearly 66 percent of the total reductions. By 2030, however, the higher allowance prices lead to a significant shift in energy decisions, particularly in the electricity sector, and the reduction in energy-related CO<sub>2</sub> emissions account for almost 58 percent of total GHG emissions reductions.
- An allowance allocation incentive for carbon sequestration, available only in the Phased Auction case, is projected to result in an additional emissions impact of 296 MMTCO<sub>2</sub>e in 2020 and 311 MMTCO<sub>2</sub>e in 2030, or about 4 percent of covered emissions.
- In 2004 dollars, the allowance prices rise from just over \$3.70 per metric tons CO<sub>2</sub> equivalent in 2012 to the safety valve price of \$14.18 metric tons CO<sub>2</sub> equivalent in 2030.

## Energy Markets

- The cost of GHG allowances is passed through to consumers, raising the price of fossil fuels charged and providing an incentive to lower energy use and shift away from fossil fuels, particularly in the electric power sector.
- When allowance costs are included, the average delivered price of coal to power plants in 2020 increases from \$1.39 per million Btu in the reference case to \$2.06, an increase of 48 percent. By 2030 the change grows from \$1.51 per million Btu in the reference case to \$2.73 per million Btu, an increase of 81 percent.
- Electricity prices are somewhat lower in the Phased Auction case than in the Full Auction case because the Phased Auction provides a portion of the allowances to the electric power sector for free, a benefit that is passed on to ratepayers where the recipients are subject to cost-of-service regulation. Electricity prices in 2020 are 3.6 and 5.6 percent higher than in the reference case in the Phased and Full Auction cases, respectively. In 2030, electricity prices are 11 and 13 percent above the reference case level. Electricity price impacts are likely to vary across states and regions due to differences in State regulatory regimes and in the fuel mix used for generation in each area.
- Relative to the reference case, annual per household energy expenditures in 2020 are 2.6 percent (\$41) higher in the Phased Auction case and 3.6 percent (\$58) higher in the Full Auction case. By 2030, projected annual per household energy expenditures range from 7.0

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<sup>6</sup> Offset credits are certified reductions in greenhouse gases from uncovered (or exempted) sources. Under the emission offset provision, covered entities can submit “offset credits” in place of allowances. Therefore, the relevant compliance target measure is covered emissions less offsets.

percent to 8.1 percent (\$118 to \$136) higher in the two cases. The difference primarily reflects the lower electricity prices in the Phased Auction case.

- Coal use is projected to continue to grow, but at a much slower rate than in the reference case. Total energy from coal increases by 23 percent between 2004 and 2030, less than half the 53-percent increase projected in the reference case over the same time period.
- The proposal significantly boosts nuclear capacity additions and generation. The projected 47-gigawatt increase in nuclear capacity between 2004 and 2030 allows nuclear to continue to provide about 20 percent of the Nation's electricity in 2030. In the reference case, nuclear capacity increases by only 9 gigawatts between 2005 and 2030.
- The proposal also adds significantly to renewable generation. In the reference case, renewable generation is projected to increase from 358 billion kilowatthours in 2004 to 559 billion kilowatthours in 2030. In the Phased Auction case, renewable generation increases to 572 billion kilowatthours by 2020 and 823 billion kilowatthours by 2030. Most of the increase in renewable generation is expected to be from non-hydroelectric renewable generators, mainly biomass and wind.
- Retail gasoline prices in 2030 are \$0.11 per gallon higher in 2030 compared to the *AEO2006* reference case, leading to modest changes in vehicle purchase and travel decisions. The transportation sector provides only a small amount of emissions reduction.

## **Economy**

- While the Phased Auction and Full Auction cases have similar energy market impacts, the macroeconomic impacts of the two cases differ because of differences in the revenue flows associated with emission allowances.
- In the Phased Auction case, the \$50-billion cap (nominal dollars) on the maximum cumulative deposits to the Climate Change Trust Fund is reached in 2017, and all subsequent revenues from allowance sales or safety valve payments go to the U.S. Treasury. This leads to a \$59-billion reduction in the Federal deficit by 2030. However, in the Full Auction case, the revenues flowing to the government are much larger, resulting in a \$200-billion reduction in the Federal deficit in 2030.
- In the Phased Auction case, wholesale energy prices rise steadily and, by 2030, are approximately 12 percent above the reference case levels (after inflation). This translates into 8-percent higher energy prices at the consumer level by 2030 and a 1-percent increase in the All-Urban Consumer Price Index (CPI) above the reference case level.
- In the Phased Auction case, discounted total GDP (in 2000 dollars) over the 2009-2030 time period is \$232 billion (0.10 percent) lower than in the reference case, while discounted real consumer spending is \$236 billion (0.14 percent) lower. In 2030, in the Phased Auction case, real GDP is projected to be \$59 billion (0.26 percent) lower than in the reference case, while aggregate consumption expenditures, which relate more directly to impacts on



consumers, are \$55 billion (0.36 percent) lower. The reductions in GDP and consumption reflect the rise in energy prices and the resulting decline in personal disposable income.

- While higher energy costs and lower consumption expenditures tend to discourage investment, many provisions of the bill help to support investment activity. The value of allowances allocated to States is substantial, and some portion of the allowance revenue would likely result in increased investment. In addition, the portion of the allowances allocated to the private sector generates funds which would help spur private investment in energy saving technologies.

**Table ES1: Summary Energy Market Results for the Reference and \$7 Phased Auction Cases**

Projection	2004	2020		2030	
		AEO2006 Reference	Phased Auction	AEO2006 Reference	Phased Auction
<b>Emissions of Greenhouse Gases (million metric tons CO<sub>2</sub> equivalent)</b>					
Energy-Related Carbon Dioxide	5,900	7,119	6,926	8,114	7,387
Other Covered Emissions	259	452	195	627	235
Total Covered emissions	6,159	7,571	7,121	8,742	7,622
Total Greenhouse Gases	7,122	8,649	8,087	9,930	8,671
<b>Emissions Reduction from Reference Case (million metric tons CO<sub>2</sub> equivalent)</b>					
Energy-Related Carbon Dioxide	-	-	193	-	727
Other Covered Emissions	-	-	258	-	392
Nonenergy Offset Credits	-	-	111	-	140
Carbon Sequestration	-	-	296	-	311
Total Emission Reductions	-	-	562	-	1,259
Total (including sequestration)	-	-	858	-	1,570
<b>Allowance Price (2004 Dollars per metric ton CO<sub>2</sub> equivalent)</b>	-	-	7.15	-	14.18
<b>Delivered Energy Prices (2004 dollars per unit indicated) (includes allowance costs)</b>					
Motor Gasoline (per gallon)	1.90	2.08	2.14	2.19	2.30
Jet Fuel (per gallon)	1.22	1.42	1.50	1.56	1.69
Distillate (per gallon)	1.74	1.93	2.04	2.06	2.25
Natural Gas (per thousand cubic feet)	7.74	7.14	7.55	8.22	9.10
Residential Electric Power	10.72	10.48	10.87	11.67	12.59
Coal, Electric Power (per million Btu)	1.39	1.39	2.06	1.51	2.73
Electricity (cents per kilowatthour)	7.57	7.25	7.51	7.51	8.31
<b>Fossil Energy Consumption (quadrillion Btu)</b>					
Petroleum	40.1	48.1	47.2	53.6	52.0
Natural Gas	23.1	27.7	27.4	27.7	27.9
Coal	22.5	27.6	26.4	34.5	27.7
<b>Electricity Generation (billion kilowatthours)</b>					
Petroleum	120	107	49	115	49
Natural Gas	702	1,103	1,184	993	1,190
Coal	1,977	2,505	2,370	3,381	2,530
Nuclear	789	871	871	871	1,168
Renewable	358	515	572	559	823
Total	3,955	5,108	5,055	5,926	5,768

Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006B.

- GDP and consumption impacts in the Full Auction case are substantially larger than those in the Phased Auction case. Relative to the reference case, discounted total GDP (in 2000 dollars) over the 2009-2030 time period in the Full Auction case is \$462 billion (0.19 percent lower), while discounted real consumer spending is \$483 billion (0.29 percent) lower. In 2030, projected real GDP in the Full Auction case is \$94 billion (0.41 percent) lower than in the reference case, while aggregate consumption is \$106 billion (0.69 percent) lower, almost twice the estimated consumption loss in the Phased Auction case. These results reflect the substantially higher level of auction revenues under the Full Auction case, which, by assumption, are not re-circulated into the economy beyond the \$50 billion in expenditures from the Climate Change Trust Fund. Because these estimated impacts could change significantly under alternative revenue recycling assumptions, these results do not imply a general conclusion that a Phased Auction will necessarily result in lesser impacts on GDP and consumption than a Full Auction.

# 1. Background and Scope of the Analysis

This service report was prepared by the Energy Information Administration (EIA), in response to a September 27, 2006, request from Senators Bingaman, Landrieu, Murkowski, Specter, Salazar, and Lugar (Appendix A). The Senators requested that EIA assess the impacts of a proposal that would regulate emissions of greenhouse gases (GHGs) through an allowance cap-and-trade system. The program would set the cap to achieve a reduction in emissions relative to economic output, or greenhouse gas intensity.<sup>7</sup>

The analysis presented in this report builds on previous EIA analyses addressing GHG limitation, including earlier EIA reports requested by Senator Bingaman<sup>8</sup>, Senator Salazar<sup>9</sup>, and Senators Inhofe, McCain, and Lieberman.<sup>10</sup> All of the analysis cases incorporate the economic and technology assumptions used in the AEO2006 reference case. While increased expenditures for research and development (R&D) resulting from the creation of the Climate Change Trust Fund are expected to lead to some technology improvements, a statistically reliable relationship between the level of R&D spending for specific technologies and the impacts of those expenditures has not been developed. Furthermore, the impact of Federal R&D is also difficult to assess, because the levels of private sector R&D expenditures usually are unknown and often far exceed R&D spending by the Federal Government.

However, the recent reports for Senators Bingaman and Salazar include additional sensitivity analyses on the assumptions made regarding the availability of GHG emissions reductions outside the energy sector and the pace of advances in technology used to produce and consume energy. The report for Senators Inhofe, McCain, and Lieberman also examines the economic implications of possible alternative approaches to recycling revenues collected by government under a cap-and-trade program in which significant amounts of government revenue is collected from allowance auctions. Alternative assumptions in these areas can have a major impact on the results obtained, and the insights from those prior sensitivity cases would also be applicable to the proposals analyzed in this report. Readers interested in how the results reported below might be affected by different assumptions in these areas are encouraged to review the earlier reports.

In this latest request, EIA was asked to analyze the impacts of a draft Congressional bill (Appendix B) that was provided with the analysis request. A summary of the program and the reasoning behind it (Appendix C) was also provided. The draft bill calls for an emissions cap-and-trade program similar to that recommended by NCEP, but with differences in timing, flexibility, allowance allocation, and other provisions. The bill also establishes a program to provide incentives and fund research, development, and deployment (RD&D) of technologies to reduce greenhouse gas emissions.

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<sup>7</sup> Greenhouse gas intensity is defined as the emissions of greenhouse gases from covered sources per real dollar of GDP (in 2000 dollars). Greenhouse gases are measured in metric tons of carbon dioxide (CO<sub>2</sub>) equivalent.

<sup>8</sup> Energy Information Administration, *Impacts of Modeled Recommendations of the National Commission on Energy Policy*, SR/OIAF/2005-02 (Washington, DC, April, 2005) web site <http://www.eia.doe.gov/oiaf/servicerpt/bingaman/index.html>

<sup>9</sup> Energy Information Administration, *Energy Market Impacts of Alternative Greenhouse Intensity Reduction Goals*, SR/OIAF/2006-01 (Washington, DC, March, 2006) web site [http://www.eia.doe.gov/oiaf/servicerpt/agg/pdf/sroiaf\(2006\)01.pdf](http://www.eia.doe.gov/oiaf/servicerpt/agg/pdf/sroiaf(2006)01.pdf)

<sup>10</sup> Energy Information Administration, *Analysis of S.139, the Climate Stewardship Act of 2003*, SR/OIAF/2003-02 (Washington, DC, June 2003) web site [http://www.eia.doe.gov/oiaf/servicerpt/ml/pdf/sroiaf\(2003\)02.pdf](http://www.eia.doe.gov/oiaf/servicerpt/ml/pdf/sroiaf(2003)02.pdf)

The gases covered in this analysis of the proposal include energy-related carbon dioxide (CO<sub>2</sub>), methane from coal mining, nitrous oxide from nitric acid and adipic acid production, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.<sup>11</sup> Under the draft bill, the emissions of these gases would be regulated through an “upstream” market-based emissions allowance program, meaning fuel suppliers and producers of greenhouse gases would be regulated. This contrasts with proposals where the entities responsible for the actual release of the emissions, such as electric power producers, manufacturers, or building owners are held responsible for emissions compliance and reporting. An upstream approach could simplify the administration of a greenhouse gas cap and trade program by limiting the number of regulated entities.

The bill establishes caps on annual emissions by creating a fixed number of tradable emission permits, or allowances, which provide the right to release a given amount of greenhouse gases in units of carbon dioxide equivalence, based on the global warming potential of each gas. To comply, regulated entities would have to submit the allowances to cover the emissions that result from their products. The number of allowances issued for each year would be determined based on a goal to reduce GHG intensity in two phases. In the first phase, from 2012 to 2021, the GHG intensity reduction goal is 2.6 percent per year, allowing some growth in the absolute level of emissions, because the gross domestic product is projected to grow faster, about 3 percent annually, over the same period. Beginning in 2022, the GHG intensity reduction goal is raised to 3.0 percent per year. With an emissions cap based on projected GHG intensity, the cap is flexible, allowing a higher level of future emissions if economic growth is faster than anticipated or a lower subsequent cap if economic expansion is slower than anticipated.

To limit the potential cost of the program, a “safety-valve” provision allows regulated entities to pay a pre-established emissions fee in lieu of submitting an allowance. As a result, actual aggregate emissions could exceed the cap if compliance costs reach the safety-valve level, as some entities would pay the fee to meet their obligations. The alternative emissions fee, or safety-valve price, is initially set at \$7 per metric ton of carbon dioxide equivalent for 2012 and increases each year by 5 percent over the projected rate of inflation, as measured by the projected increase in the implicit price deflator for gross domestic product (GDP). In 2004 dollars, the safety valve is set to \$5.89 in 2012 and rises to \$14.18 in 2030.

Several provisions offer additional flexibility and extend the effective scope of the program. Under the emission offset provision, covered entities can submit “offset credits” that reflect certified reductions in greenhouse gases from uncovered (or exempted) sources in place of allowances. To provide further flexibility, emission allowances can be saved, or banked, for use in subsequent years if they are left unused in the year for which they were issued. This provides an incentive to over-comply, or reduce emissions further than that required, thus saving the allowances for future years in which marginal compliance costs might be higher. Another provision provides incentives to reward entities that reduce emissions before the program starts.

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<sup>11</sup> Specific provisions in the bill define the covered entities and the respective gases subject to regulation more precisely; however, the emissions accounting in NEMS precludes a more detailed treatment.

A portion of the emission allowances allocated each year is auctioned by the Federal government, with the percentage set at 10 percent in the first 5 years, then increasing by 2 percentage points each year beginning in 2017. Table 1 shows the percentage of allowances distributed by year to individual sectors for 2012 through 2030. The methodology for allocating allowances to individual entities in each of the sectors varies, but, in general, a “grandfathered” approach where the allocation is based on historical output is used. For example, the allocation to individual coal mines is based on the each coal mine’s share of the total carbon of coal produced over the 3-year period beginning January 1, 2004. Most of the allowances not auctioned each year are allocated to fossil fuel suppliers and producers of non-CO<sub>2</sub> GHGs, electric power generators and other fuel users and GHG emitters in the industrial sector, and State governments. Some allowances (up to 1 percent) would be provided as incentives to reward entities that have voluntarily reduced emissions in advance of the 2012 start date, while others (up to 5 percent) would be provided as incentive for activities that sequester carbon, such as certain agricultural practices, increases in forestation, and carbon capture and storage. Increases in carbon sequestration do not substitute for allowance requirements, so any net emissions impact from this provision is incremental. Insofar as the timing of auctions is concerned, half the emission allowances are auctioned 4 years in advance of the year for which they are issued, and half are auctioned in the year of issue.<sup>12</sup>

### Analysis Cases

In the original analysis request, EIA was asked to analyze two variants of the proposal: one in which the allowances are mostly allocated freely as indicated in the draft bill, with some allowances auctioned, and another in which no allowances are allocated freely (all are auctioned). These two cases, referred to as the Phased Auction<sup>13</sup> case and the Full Auction case, will be the primary focus of the analysis. Both cases incorporate the \$7 per metric ton of carbon dioxide equivalent safety-valve price for 2012, which then increases each year by 5 percent over the projected rate of inflation. The Phased Auction case incorporates the allowance allocation plan outlined above, while the Full Auction case provides no free allocation of allowances to fossil fuel suppliers and producers of non-CO<sub>2</sub> GHGs, electric power generators and other fuel users and GHG emitters in the industrial sector, or State governments. Nor are allowances used as an incentive for carbon sequestration or early action. Instead, the Full Auction case assumes all of the auction revenue collected goes to the U.S. Treasury. The RD&D spending under the bill’s Climate Trust Fund provision, capped at a cumulative \$50 billion dollars, is treated similarly in the two cases. The difference, however, is that under the Full Auction case, the auction revenue collected is substantially more than under the Phased Auction case.

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<sup>12</sup> An exception is that the early auction for 2012 allowances is held in 2009, 3 years in advance. Also, allowances purchased in advance may not be used until the year for which they were issued.

<sup>13</sup> The term “phased” is meant to describe the gradually increasing share of allowances that are auctioned over time.

**Table 1. Allowance Distribution**  
(Percent)

Year	Auction	Allocation to Fossil Fuel Suppliers and Producers of Non-CO <sub>2</sub> GHGs				Allocation to Energy Users and Other GHG emitters		Set-Aside Programs		Allocation to States
		Coal	Petroleum	Natural Gas	Non-CO <sub>2</sub> GHGs	Electric Generators	Industrial Sectors	Agricultural Sequestration	Early Reduction Credits	
2012	10.00	7.00	4.00	2.00	2.00	30.00	10.00	5.00	1.00	29.00
2013	10.00	7.00	4.00	2.00	2.00	30.00	10.00	5.00	1.00	29.00
2014	10.00	7.00	4.00	2.00	2.00	30.00	10.00	5.00	1.00	29.00
2015	10.00	7.00	4.00	2.00	2.00	30.00	10.00	5.00	1.00	29.00
2016	10.00	7.00	4.00	2.00	2.00	30.00	10.00	5.00	1.00	29.00
2017	12.00	6.75	3.85	1.93	1.93	28.91	9.64	5.00	1.00	29.00
2018	14.00	6.49	3.71	1.85	1.85	27.82	9.27	5.00	1.00	29.00
2019	16.00	6.24	3.56	1.78	1.78	26.73	8.91	5.00	1.00	29.00
2020	18.00	5.98	3.42	1.71	1.71	25.64	8.55	5.00	1.00	29.00
2021	20.00	5.73	3.27	1.64	1.64	24.55	8.18	5.00	0.00	30.00
2022	22.00	5.47	3.13	1.56	1.56	23.45	7.82	5.00	0.00	30.00
2023	24.00	5.22	2.98	1.49	1.49	22.36	7.45	5.00	0.00	30.00
2024	26.00	4.96	2.84	1.42	1.42	21.27	7.09	5.00	0.00	30.00
2025	28.00	4.71	2.69	1.35	1.35	20.18	6.73	5.00	0.00	30.00
2026	30.00	4.45	2.55	1.27	1.27	19.09	6.36	5.00	0.00	30.00
2027	32.00	4.20	2.40	1.20	1.20	18.00	6.00	5.00	0.00	30.00
2028	34.00	3.95	2.25	1.13	1.13	16.91	5.64	5.00	0.00	30.00
2029	36.00	3.69	2.11	1.05	1.05	15.82	5.27	5.00	0.00	30.00
2030	38.00	3.44	1.96	0.98	0.98	14.73	4.91	5.00	0.00	30.00

Source: Senate staff.

In a follow-up letter (Appendix D), EIA was asked to address several additional issues. EIA was asked to examine the impact of higher and lower starting prices for the program's safety valve price. To address this request, two sensitivity cases with the safety valve prices starting at \$5 and \$9, referred to as the \$5 Phased Auction and \$9 Phased Auction cases, were prepared.

EIA was also asked to estimate the impacts of not allowing or limiting GHG offsets. To analyze this issue a case not allowing offsets, the No Offsets case, was prepared. One category of offset credits is for non-energy use of fossil fuels (primarily for chemical feedstocks). The potential carbon dioxide emissions of these fuels would be included in this upstream regulatory approach, so the need to adjust for non-energy use of the fuel arises. With the National Energy Modeling System (NEMS), however, the potential carbon dioxide emissions from these fuels are omitted in the emission accounting and are therefore not treated as an offset in this analysis, but are instead omitted from the regulated emissions directly. Therefore, the No Offsets case does not change the treatment of non-energy use of fossil fuels. The classes of emissions that *are* treated as offsets and for which emissions abatement cost estimates were available from the Environmental Protection Agency (EPA) are methane emissions from natural gas production and distribution and methane emissions from small landfills. Estimated emissions reductions from these two sources are excluded in the No Offsets case.

EIA was further asked to address “the impact on program costs and the distribution of those costs associated with using a different point of regulation, specifically an alternative in which the point of regulation for coal was downstream (i.e., at electric power plants and industrial sources.” EIA can not quantify the effects of a different point of regulation using NEMS, but the potential implications of different points of regulation will be discussed. The results of the \$5 Phased Auction, \$9 Phased Auction and No Offset sensitivity cases are only discussed in key areas to highlight important impacts including the impacts on allowance prices, program compliance, and coal use. In previous reports, EIA has prepared numerous greenhouse gas cap-and-trade sensitivity analyses, examining the impacts of alternative emission caps, alternative combinations of emission caps and safety-valve prices, alternative assumptions about potential emission reductions in non-energy related greenhouse gases, and alternative assumptions about the cost of performance of new appliances, motor vehicles, and energy production equipment.<sup>14</sup>

## Methodology

The analysis of energy sector and energy-related economic impacts of the various GHG emission reduction proposals in this report is based on NEMS results. NEMS projects emissions of energy-related CO<sub>2</sub> emissions resulting from the combustion of fossil fuels, representing about 84 percent of total GHG emissions today. For this analysis, the *AEO2006* reference case emissions for energy-related CO<sub>2</sub> were augmented with baseline emissions projections for other covered GHGs to create a baseline for total covered GHG emissions. Projections of non-CO<sub>2</sub> GHG emissions, including the covered non-CO<sub>2</sub>

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<sup>14</sup> These reports are all available at [http://www.eia.doe.gov/oiaf/service\\_rpts.htm](http://www.eia.doe.gov/oiaf/service_rpts.htm).

gases, are derived from an unpublished, EPA “no-measures” case, a recent update to the “business-as-usual” case cited in the White House Greenhouse Gas Policy Book Addendum<sup>15</sup> released with the Climate Change Initiative. The projections from the Policy Book were based on several EPA-sponsored studies conducted in preparation of the U.S. Department of State’s *Climate Action Report 2002*.<sup>16</sup> However, the no-measures case used in this analysis was a preliminary, unpublished projection developed by EPA in preparation for a forthcoming update of that report.<sup>17</sup>

Simulations of the emissions cap-and-trade policy in NEMS were used to estimate the price of GHG allowances over time and the resulting changes in the energy system. First, starting from the projected level of energy-related CO<sub>2</sub> emissions in 2011 from the *AEO2006* reference case and the EPA projection for emissions of other GHGs in 2011, the GHG intensity rate reduction targets for each of the analysis cases were translated into annual emissions targets for the 2012 to 2030 period.

NEMS endogenously calculates changes in energy-related CO<sub>2</sub> emissions in the analysis cases. The cost of using each fossil fuel includes the costs associated with the GHG allowances needed to cover the emissions produced when they are used. These adjustments influence energy demand and energy-related CO<sub>2</sub> emissions. The GHG allowance price also determines the reductions in the emissions of other GHGs based on the abatement cost relationships supplied by EPA. With emission allowance banking, NEMS solves for the time path of permit prices such that cumulative emissions match the cumulative target, provided the permit price remains below the safety-valve permit price. Once the safety-valve permit price is attained and the previously-banked permits are exhausted, actual GHG emissions can exceed the calculated annual emissions target, as covered entities can pay the safety-valve fee in place of providing the government-issued emissions allowances.

The NEMS Macroeconomic Activity Module (MAM), which is based on the Global Insight U.S. model, interacts with the energy supply, demand, and conversion modules of NEMS to solve for an energy-economy equilibrium. In an iterative process within NEMS, MAM reacts to changes in energy prices, energy consumption, and allowance revenue, solving for the effect on macroeconomic and industry level variables such as real GDP, the unemployment rate, inflation, and real industrial output. These economic impacts, in turn, feed back into the energy sectors of NEMS. The cycle is repeated until an integrated solution is obtained. The economic impacts of the legislation stem partly from its impact on energy prices and its effects on production, imports, and exports of energy goods and services. In addition, the auction and distribution of the GHG

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<sup>15</sup> See “Addendum” in the “Global Change Policy Book” at <http://www.whitehouse.gov/news/releases/2002/02/climatechange.html>. The business-as-usual (BAU) projections cited in the addendum are somewhat higher than a “Policies and Measures” case EPA developed for the *U.S. Climate Action Report 2002*.

<sup>16</sup> U.S. Department of State, *U.S. Climate Action Report 2002* (Washington, DC, May 2002), Chapter 5, “Projected Greenhouse Gas Emissions,” pp. 70-80, web site: <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsUSClimateActionReport.html>.

<sup>17</sup> Personal communication from Casey Delhotal, of the Environmental Protection Agency, to Dan Skelly of the Energy Information Administration, on July 7, 2005. EIA adjusted the EPA’s preliminary no-measures case projections to extrapolate from the most recent 2002-to-2004 data on these gases as published by EIA, as well as to estimate the intervening years of the projections, since the projections were only provided for every 5 years beginning in 2005 and ending in 2020. In addition, EIA extrapolated the projection to 2030 for this analysis based on the average annual growth rates of individual emissions sources from 2015 to 2020.



allowances generate revenue streams to the government and private sectors. The MAM represents the revenue streams accruing to these sectors based on the allowance allocations specified in the draft bill, as well as the bill's \$50 billion in cumulative RD&D<sup>18</sup> expenditures funded from auction revenues. Together, these energy-related price, quantity, and revenue allocation effects impact on the aggregate level of prices, output, and employment within the economy.

While NEMS is able to represent the broad energy and economic impacts of the emissions allowance program, there is little in the model to distinguish the merits of the point of regulation (downstream or upstream) and only a limited ability to represent alternate allowance allocation schemes. Depending on the distribution of allowances, some industries, firms, or localities may be partly or fully compensated for the compliance costs and economic disruption. While such free allowance allocation can offset some of the direct cost of compliance to recipients, their incentives to take action based on allowance opportunity costs are similar whether they are given the allowances or whether they buy them at auction. NEMS is not designed to evaluate the distributional impacts of whether industries are better or worse off under a given allocation scheme, but it does reflect the marginal allowance opportunity costs that give rise to emission compliance activities. In addition, NEMS simulates the broad impacts of the emissions policy on the economy as a whole, without regard to how individual industries or communities will fare under such a program.

This analysis assumes that the transaction and administrative costs of implementing and operating a GHG cap and trade program will be small when compared to the costs of the allowances themselves. The "upstream" regulatory approach in the proposal analyzed, which requires large suppliers of fossil fuel and other sources of greenhouse gases to submit government-issued allowances based on the emissions potential of their products, is designed to reduce the control program costs. Because so many sources produce GHG emissions, a "downstream" approach that focuses on monitoring each source of actual emissions and collecting the required allowances from them could be much more costly. For example, there are more than 100 million residential and commercial buildings and over 200 million personal autos that produce GHG emissions. A program that required monitoring all of these sources would likely be more expensive than the one in the proposed bill. If the program costs were to turn out to be significant when compared to the cost of allowances, the efficiency and success of the program would be impacted.

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 are random and cannot be anticipated (including severe weather, technological breakthroughs, and geopolitical developments), energy markets are subject to uncertainty. Moreover, future developments in technologies, demographics, and resources cannot be foreseen with certainty. Nevertheless, well-formulated models are useful in analyzing complex

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<sup>18</sup> The potential energy efficiency improvements and other carbon mitigation effects of the proposed RD&D provisions and incentives of the bill are not evaluated in this report.

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 *AEO2006* reference case is based on current laws and regulations as of October 31, 2005. 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.

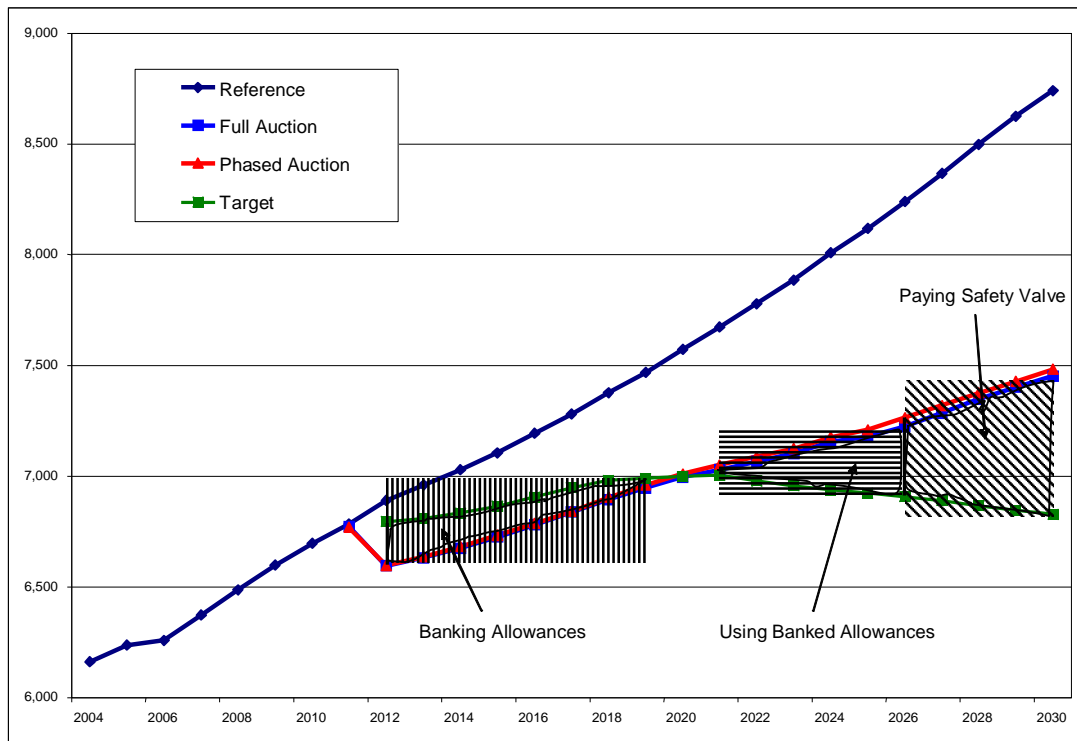
This report, like other EIA analyses of energy and environmental policy proposals, focuses on the impacts of those proposals on energy choices made by consumers in all sectors and the implications of those decisions for the economy. This focus is consistent with EIA's statutory mission and expertise. The study does not account for any possible health or environmental benefits that might be associated with curtailing GHG emissions.

## 2. Energy Market Impacts of Alternative Greenhouse Gas Intensity Reduction Goals

### Greenhouse Gas Emissions and Permit Prices

Relative to the *AEO2006* reference case, projected GHG emissions are reduced starting in 2012 as a result of the allowance program and the GHG intensity targets (Figure 1). With banking of allowances permitted, an incentive exists to over-comply in the first few years of the program, when the emissions targets are relatively easy to meet and allowance prices are low, and to draw down the bank balance later as the targets become more stringent and prices rise. As a result, projected emissions in both the Phased Auction and Full Auction cases are below the intensity-based target for emissions from 2012 to 2020 and above the target thereafter.<sup>19</sup> Once the market price for allowances reaches the safety valve level in 2026, the gap between covered emissions and the target continues to widen.

**Figure 1: Covered Greenhouse Gas Emissions, Net of Offset Credits**  
(million metric tons carbon dioxide equivalent)

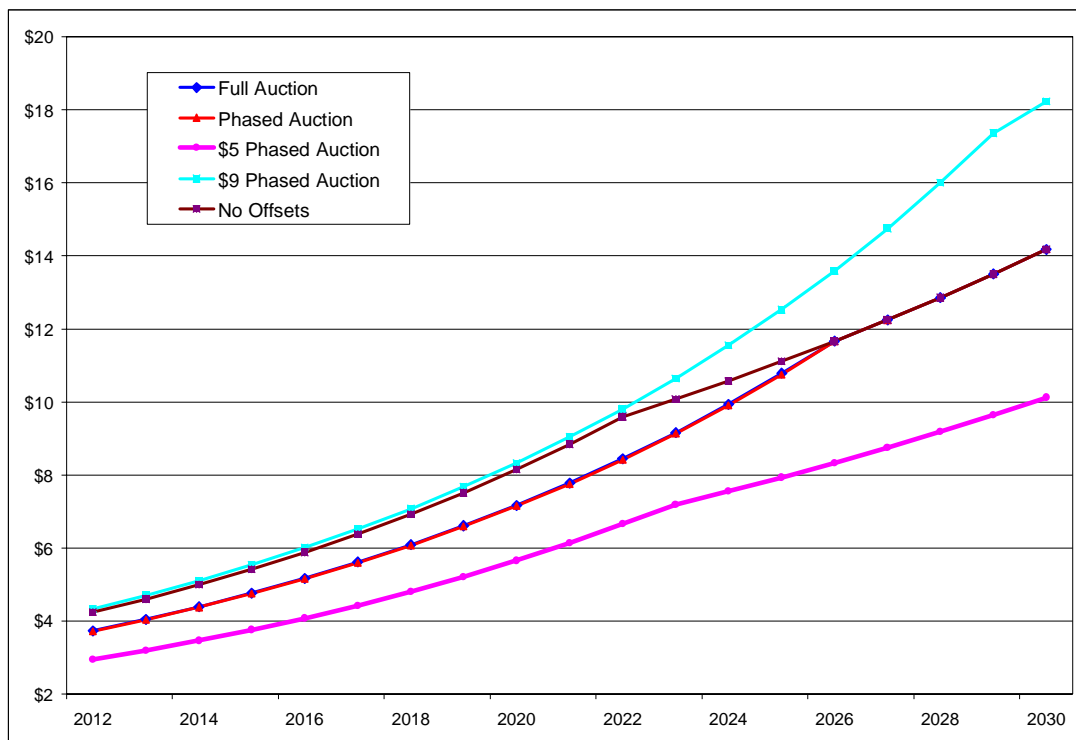


Source: National Energy Modeling System runs AEO2006.D111905A, BL\_PHASED7.D112006B, and BL\_FULL7.D112006C.

<sup>19</sup> The figure plots total covered GHG gas emissions, less offsets credits, compared to the target. Not shown are the increases in carbon sequestration in the Phased Auction case that are projected as a result of the proposed bill's allowance allocation incentives. Total GHG emissions are somewhat higher than covered emissions because some sources are exempted.

The market price for emissions allowances is assumed to reflect financial incentives to bank emissions allowances over time, limited by the established safety-valve price, which grows over time at a rate of 5 percent per year (after inflation). To represent the proposed bill, a path of allowance prices is calculated based on an assumed rate of return on banked allowances of 8.5 percent per year up until the safety valve price is reached.<sup>20</sup> Under these assumptions, the allowances prices derived in the Phased Auction and Full Auction cases are essentially the same (Figure 2). However, the economic impacts of these cases, and some of the energy market impacts, differ due to the distributional impacts from allowance allocation. Table 2 summarizes the emissions and energy market impacts of the Phased and Full Auction cases relative to the *AEO2006* reference case.

**Figure 2: Projected Allowance Prices**  
(2004 dollars per metric ton carbon dioxide equivalent)



Source: National Energy Modeling System runs BL\_FULL.D112006C, BL\_PHASED7.D112006B, BL\_PHASED5.D111306A, BL\_PHASED9.D112006B, and BL\_PHASED7NO.D112006B.

<sup>20</sup> The 8.5-percent rate (real dollars) approximates the cost of capital in the electric power industry, where investments to reduce GHG emissions are likely to be tied to expectations of allowance price growth. Under this reasoning, allowance prices are assumed to increase at a real rate of 8.5 percent per year until the safety-valve level is reached or the bank balance of allowances is exhausted. Once the safety-valve price is attained, holding bank allowances would be uneconomical due to the assumed 5 percent escalation rate of the safety-valve price.

**Table 2: Summary Energy Market Results for the Reference, Phased Auction, and Full Auction Cases**

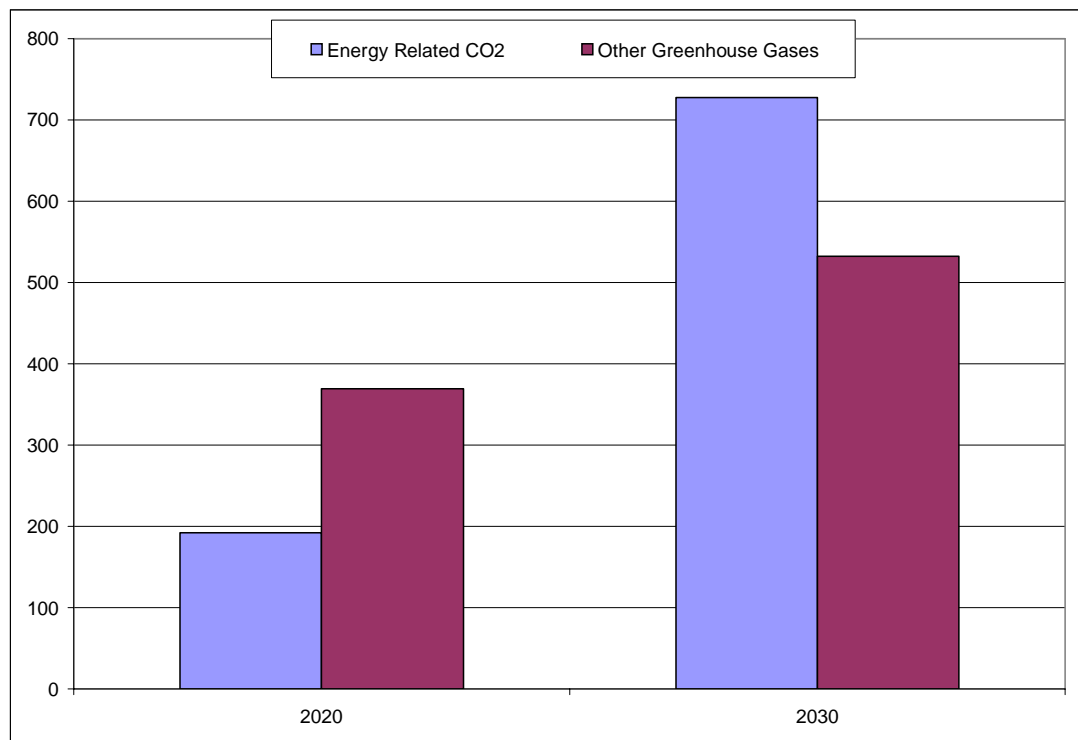
Projection	2004	2020			2030		
		AEO2006 Reference	Phased Auction	Full Auction	AEO2006 Reference	Phased Auction	Full Auction
<b>Emissions of Greenhouse Gases (million metric tons CO<sub>2</sub> equivalent)</b>							
Energy-Related Carbon Dioxide	5,900	7,119	6,926	6,913	8,114	7,387	7,358
Other Covered Emissions	259	452	195	195	627	235	235
Total Covered Emissions	6,159	7,571	7,121	7,107	8,742	7,622	7,593
Total Greenhouse Gases	7,122	8,649	8,087	8,073	9,930	8,671	8,641
<b>Emissions Reduction from Reference Case (million metric tons CO<sub>2</sub> equivalent)</b>							
Energy-Related Carbon Dioxide	-	-	193	206	-	727	757
Other Covered Emissions	-	-	258	258	-	392	392
Nonenergy Offset Credits	-	-	111	111	-	140	140
Carbon Sequestration	-	-	296	-	-	311	-
Total Emissions Reduction	-	-	562	576	-	1,259	1,289
Total (including sequestration)	-	-	858	576	-	1,570	1,289
<b>Allowance Price (2004 Dollars per metric ton CO<sub>2</sub> equivalent)</b>	-	-	7.15	7.17	-	14.18	14.18
<b>Delivered Energy Prices (2004 dollars per unit indicated) (includes allowance costs)</b>							
Motor Gasoline (per gallon)	1.90	2.08	2.14	2.13	2.19	2.30	2.30
Jet Fuel (per gallon)	1.22	1.42	1.50	1.51	1.56	1.69	1.69
Distillate (per gallon)	1.74	1.93	2.04	2.03	2.06	2.25	2.23
Natural Gas (per thousand cubic feet)	7.74	7.14	7.55	7.55	8.22	9.10	9.09
Residential	10.72	10.48	10.87	10.87	11.67	12.59	12.57
Electric Power	6.07	5.53	5.99	5.96	6.41	7.39	7.39
Coal, Electric Power (per million Btu)	1.36	1.39	2.06	2.06	1.51	2.73	2.73
Electricity (cents per kilowatthour)	7.57	7.25	7.51	7.65	7.51	8.31	8.48
<b>Fossil Energy Consumption (quadrillion Btu)</b>							
Petroleum	40.1	48.1	47.2	47.2	53.6	52.0	52.1
Natural Gas	23.1	27.7	27.4	27.3	27.7	27.9	27.9
Coal	22.5	27.6	26.4	26.4	34.5	27.7	27.4
<b>Electricity Generation (billion kilowatthours)</b>							
Petroleum	120	107	49	48	115	49	48
Natural Gas	702	1,103	1,184	1,166	993	1,190	1,180
Coal	1,977	2,505	2,370	2,362	3,381	2,530	2,500
Nuclear	789	871	871	875	871	1,168	1,156
Renewable	358	515	572	579	559	823	857
Total	3,955	5,108	5,055	5,039	5,926	5,768	5,749

Source: National Energy Modeling System runs AEO2006.D111905A, BL\_PHASED7.D112006B, and BL\_FULL7.D112006C.

Lower energy related CO<sub>2</sub> emissions and other GHG emissions both contribute to the total reduction in GHG emissions, but their respective shares of total reductions change over time. Abatement cost curves for other GHG based on EPA research suggest that there are a significant amount of emissions reductions that can be made at relatively low costs. As a result, in the early years of the program, when allowance prices are relatively low, other GHG emissions reductions dominate the overall emissions reductions. For example, in 2020 in the Phased Auction case, reductions in other GHG emissions account for nearly 66 percent of the total GHG emissions reductions (Figure 3). By 2030, however, higher allowance prices lead to a significant shift in the fuels used in the energy

sector, particularly in the electricity sector, and the reduction in energy related CO<sub>2</sub> emissions account for almost 58 percent of the total GHG emissions reductions.

**Figure 3: Greenhouse Gas Emissions Reductions in the Phased Auction Case**  
(difference from reference case in million metric tons CO<sub>2</sub> equivalent)



Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006B .

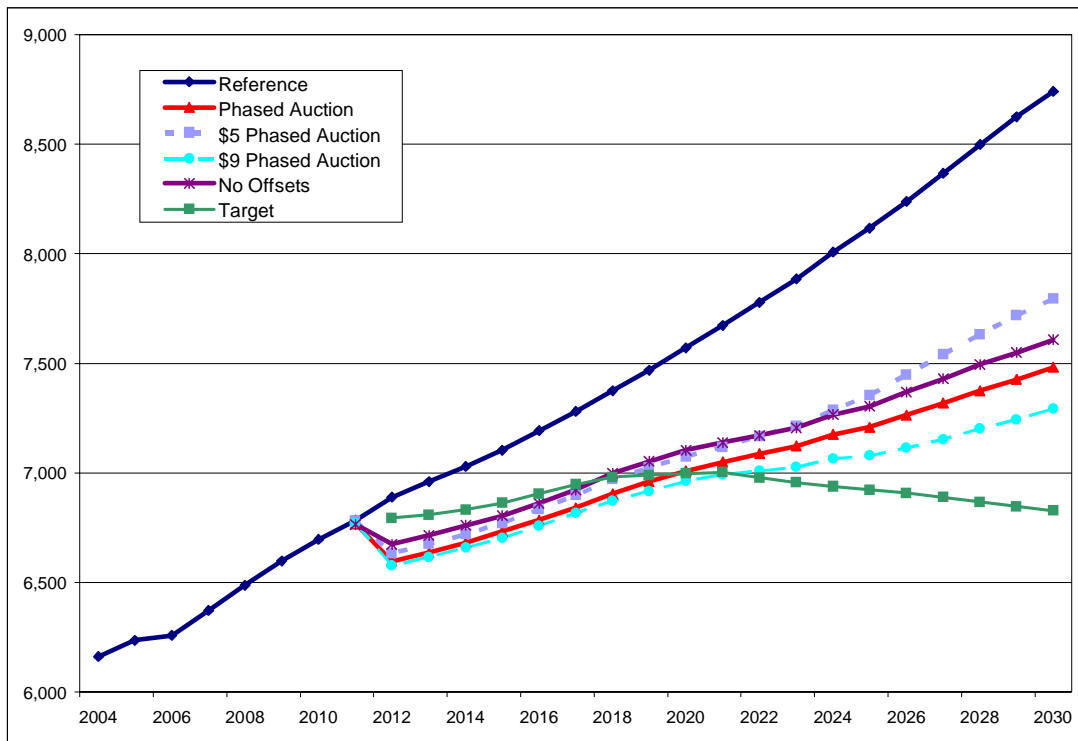
There is also an increase in carbon sequestration in the Phased Auction case. The draft bill calls for allocating up to 5 percent of the allowances each year to create a pilot program to stimulate increased agricultural carbon sequestration. Because it is a pilot program, the increase in sequestration stimulated does not count towards meeting the GHG intensity reduction target. However, based on the supply curves for carbon sequestration opportunities used in EIA’s recent GHG analyses, the allowance allocation incentives would stimulate an increase in carbon sequestration of over 300 million metric tons CO<sub>2</sub> equivalent (Table 2). In the Full Auction case, the allowance allocation incentives for carbon sequestration were assumed unavailable, since no allowances would be available to use as incentives, and the draft bill proposed no other mechanism whereby auction revenues might be used directly to promote carbon sequestration.

Because the safety-valve price is binding in these cases, establishing higher or lower safety-valve prices will influence the emission compliance results, including incentives to bank allowances and the extent to which the emissions targets are achieved. Figure 4 compares covered emissions in the Phased Auction case to those in the \$5 and \$9 Phased Auction cases. In the \$5 Phased Auction case, which assumes a lower starting value for

the safety valve, the allowance price reaches the safety-valve level in 2022, four years earlier than in the original Phased Auction case, which assumes a \$7-per-metric-ton starting price for the safety valve (nominal dollar price). Covered emissions in the \$5 Phased Auction case remain higher than the original Phased Auction case throughout the projection. In the \$9 Phased Auction case, the safety valve is not triggered until 2029. As a result, on a cumulative basis, the emissions intensity targets are projected to be achieved through 2029 in the \$9 Phased Auction case, compared to 2025 in the original Phased Auction case.

**Figure 4: Covered Greenhouse Gas Emissions, Net of Offset Credits in Sensitivity Cases**

(million metric tons carbon dioxide equivalent)



Source: National Energy Modeling System runs AEO2006.D111905A, BL\_PHASED7.D112006B, BL\_PHASED5.D111306A, BL\_PHASED9.D112006B, and BL\_PHASED7NO.D112006B.

In the No Offsets case, the provision to allow compliance with emissions reduction credits from uncovered sources is removed. Without these relatively low-cost emission reduction opportunities, the marginal compliance cost is driven up, reflected in a higher market price for allowances. The projected allowance price in the No Offsets case reaches the safety-valve level in 2022, 4 years earlier than in the Phased Auction case (Figure 2). As a result, the overall reductions in GHG emissions are somewhat less in the No Offsets case (Figure 4).

In previous assessments of similar cap-and-trade proposals for GHGs, EIA has included sensitivity results to highlight some key areas of uncertainty, including the importance of the assumed abatement costs for non-CO<sub>2</sub> gases and the effect of alternative assumptions about energy technology cost, performance, and availability. Rather than repeating those sensitivity cases, we will simply point out that these assumptions have had a bearing on the magnitude and cost of compliance. With less optimistic assumptions about abatement opportunities for other GHGs, the projected cost of compliance is driven up, the safety-valve price is likely to be attained several years earlier, and cumulative emissions reductions will be correspondingly less.

With regard to technology assumptions, the technological improvements reflected in the *AEO2006* reference case may under- or overpredict future technology trends. For example, the results of the integrated advanced technology case indicated projected CO<sub>2</sub> emissions would be 9 percent lower than in the reference case in 2030. Under such assumptions, compliance costs under the proposed bill would be less, and the intensity targets would be achieved over a longer time frame before the safety-valve price is triggered, if at all.

As shown in Figures 1 and 2, the emissions and allowance price paths in the Phased and Full Auction cases are very similar. As a result, with the exception of electricity price and macroeconomic effects, the market impacts in the two cases are essentially the same. The analysis in the remainder of this chapter will focus on the Phased Auction case, only discussing other cases where they are important.

### **Electricity Sector Emissions, Generation and Prices**

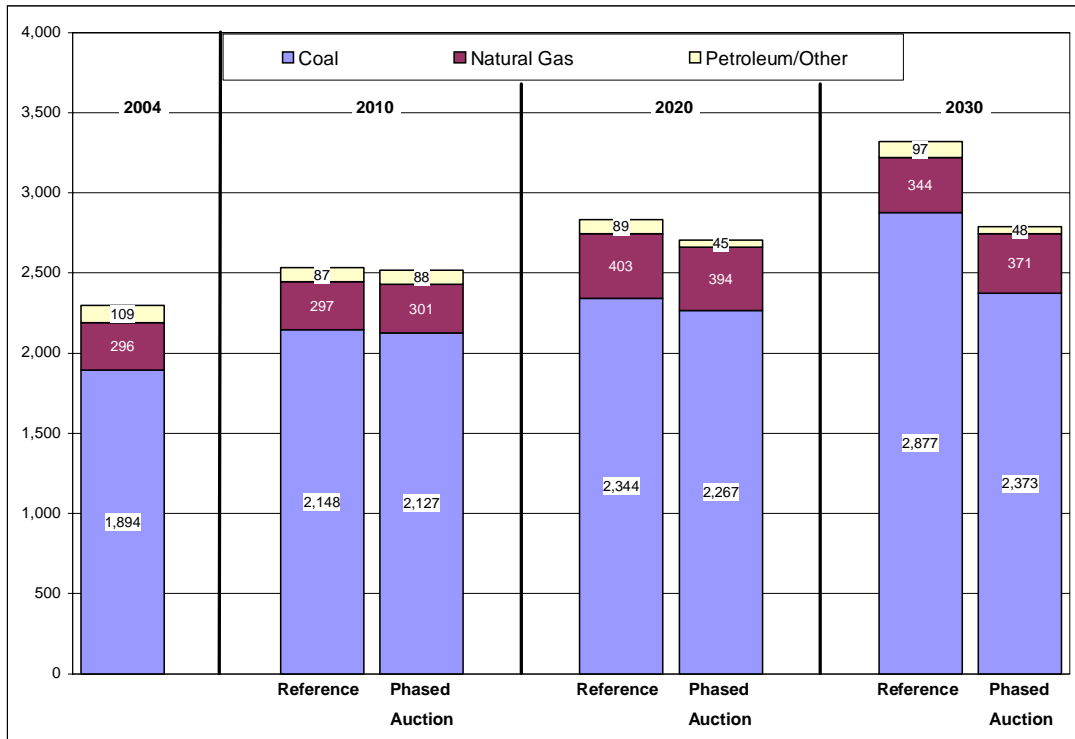
Implementing the proposed GHG intensity reduction program could have significant impacts on power sector CO<sub>2</sub> emissions, generation by fuel, generating technology selection, electricity sales, and electricity prices. The power sector shifts away from its long-term reliance on coal-fired generation, towards increasing reliance on nuclear, non-hydroelectric renewable, and natural gas generation. These changes lead to lower emissions. However, increased capital expenditures for these technologies, together with higher fossil-fuel prices, result in higher electricity prices. Because a portion of the allowances are allocated to regulated utilities for free in the Phased Auction case and because regulators are expected to pass these savings on to consumers, the impact on electricity prices is slightly smaller than in the Full Auction case.

### **CO<sub>2</sub> Emissions**

In the reference case, total power sector CO<sub>2</sub> emissions are projected to increase 44.4 percent between 2004 and 2030 as the industry increases its use of fossil fuels, particularly coal (Figure 5). However, in the Phased Auction case, CO<sub>2</sub> emissions are forecast to increase by less than half that amount, about 21 percent between 2004 and 2030, because of a greater reliance on nuclear and renewable and a less carbon-intensive fossil fuel mix. Power sector CO<sub>2</sub> emissions are expected to be 4.5 percent below the reference case level in 2020 and 15.9 percent below the reference case level in 2030 in the Phased Auction case.



**Figure 5: Power Sector CO<sub>2</sub> Emissions**  
(million metric tons CO<sub>2</sub>)

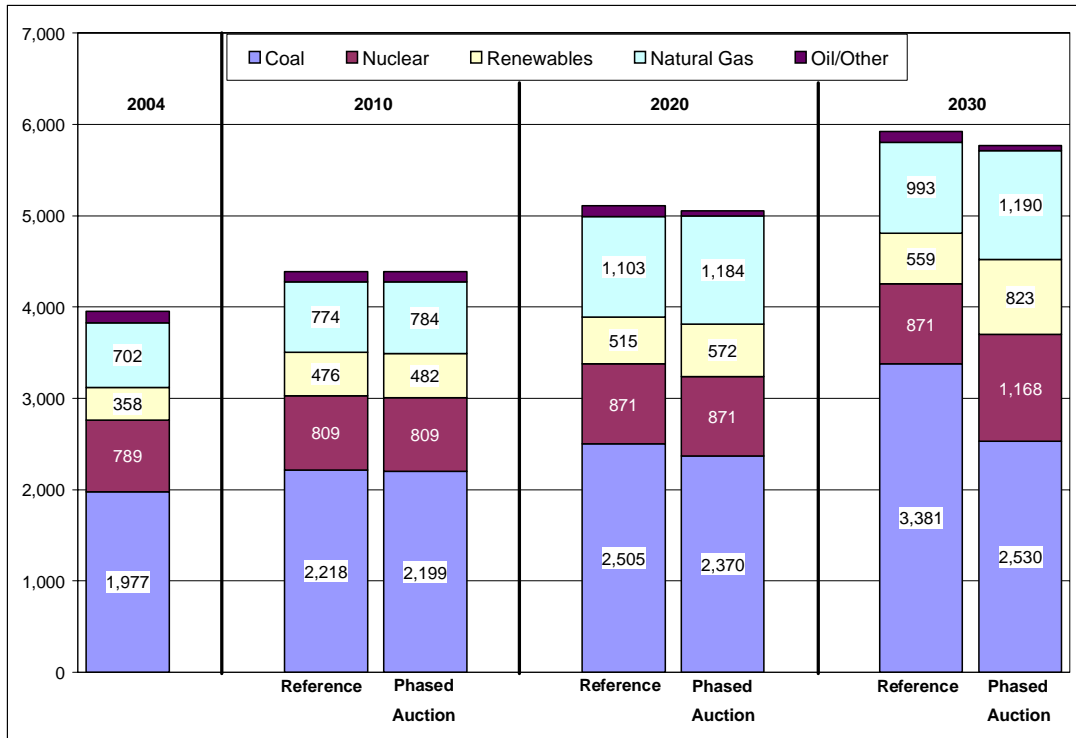


Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

### Generation by Fuel

To reduce its CO<sub>2</sub> emissions, the power industry, including generators in the industrial and commercial sectors, is expected to shift away from its historical reliance on coal generation (Figure 6). Total coal generation in 2020 is projected to be 135 billion kilowatthours (5.4 percent) below the reference case level in the Phased Auction case. By 2030, coal generation relative to the reference case is 851 billion kilowatthours (25 percent) less in the Phased Auction case. In the reference case, coal accounts for 57 percent of total generation in 2030, but its share falls to 44 percent in the Phased Auction case. While coal generation in 2030 in the Phased Auction case is well below the reference case projection it would still be substantially above the current level, increasing by 28 percent between 2004 and 2030.

**Figure 6: Generation by Fuel**  
(billion kilowatthours)

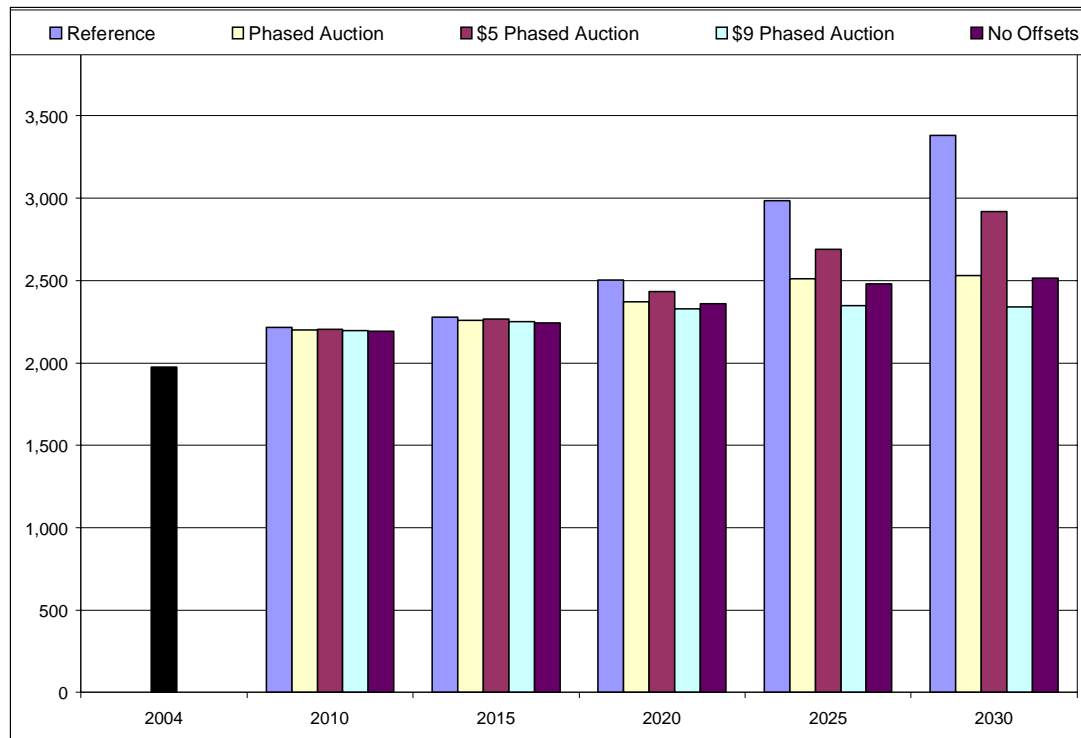


Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

The higher coal costs in the Phased Auction case greatly influence the relative economics of new plant alternatives. In the reference case, 174 gigawatts of new coal capacity is projected to be added between 2004 and 2030. In the Phased Auction case, the amount added over the same period is 51 gigawatts. The plant choice results are very sensitive to the allowance price, as indicated by the projections of coal generation across the cases (Figure 7). In the \$5 Phased Auction case, projected coal generation in 2030 is 14 percent below the reference case level, compared to 25 percent below in the original Phased Auction case and 31 percent below in the \$9 Phased Auction case. Projected coal generation in 2030 grows from its current level in all of the cases analyzed.

While successful development of carbon capture and storage technologies might allow coal-fired plants to remain competitive under a GHG allowance program, the allowance prices in this analysis are not sufficiently high to compensate for the increased capital and operating costs. As a result, power plants using carbon capture and storage are not projected to be commercially viable within the 2030 time frame in the analysis cases.

**Figure 7: Coal Generation in Sensitivity Cases**  
(billion kilowatthours)



Source: National Energy Modeling System runs AEO2006.D111905A, BL\_PHASED7.D112006B, BL\_PHASED5.D111306A, BL\_PHASED9.D112006B, and BL\_PHASED7NO.D112006B.

In contrast to the situation for coal generation, nuclear generation is projected to increase significantly in the Phased Auction case. In the reference case, nuclear generation is projected to increase from 789 billion kilowatthours in 2004 to 871 billion kilowatthours in 2030, as existing plants are upgraded by 3 gigawatts and 6 gigawatts of new capacity, stimulated by incentives in the Energy Policy Act of 2005 (EPACT2005), are added. The 47 gigawatts of nuclear capacity added in the Phased Auction case increases nuclear generation to 1,168 billion kilowatthours. As a result of the additions, the share of generation accounted for by nuclear plants in 2030 increases from 15 percent in the reference case to 20 percent in the Phased Auction case.

Renewable generation is also expected to see significant growth in the Phased Auction case. In the reference case, renewable generation is projected to increase from 358 billion kilowatthours in 2004 to 559 billion kilowatthours in 2030. Part of this growth is stimulated by tax incentives for certain renewable technologies in EPACT2005. In the Phased Auction case, renewable generation is projected to grow to 572 billion kilowatthours by 2020 and to 823 billion kilowatthours by 2030. Most of the increase in renewable generation is expected to be from non-hydroelectric renewable generators, mainly biomass and wind. In the reference case, biomass generation is forecast to rise from 37 to 103 billion kilowatthours between 2004 and 2030. In the Phased Auction case, biomass generation is expected to increase three-fold relative to the reference case

to 306 billion kilowatthours. Wind generation, projected to increase from 14 billion kilowatthours in 2004 to 65 billion kilowatthours in the reference case by 2030, is expected to increase to almost twice that amount in the Phased Auction case, where it grows to 108 billion kilowatthours. As a result, the non-hydroelectric renewable share of generation, 2.2 percent in 2004, increases significantly in the Phased Auction case. By 2030, the share grows to 9 percent in the Phased Auction case, more than twice the 4 percent share in the reference case.

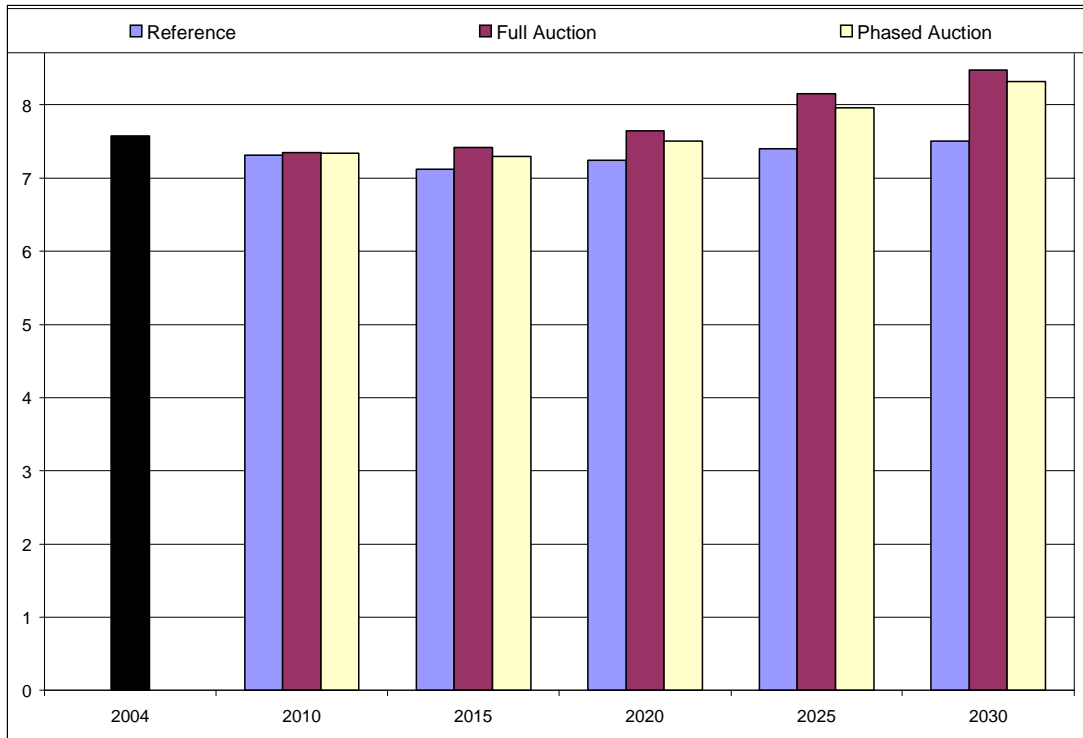
Oil and natural gas generation are also impacted by efforts to reduce power sector GHG emissions, but to lesser degrees than coal, nuclear, and renewables. Oil generation, already a very small part of electricity market, falls even further in the Phased Auction case. Relative to the reference case, natural gas generation in 2030 is 20 percent higher in the Phased Auction case, as new combined-cycle plants become more attractive, relative to coal plants, for new baseload capacity.

### **Electricity Prices**

The shift away from coal to increased use of nuclear and renewable fuels, together with the costs of fuel suppliers holding emissions permits, affects electricity prices (Figure 8). The impacts are slightly different in the Phased and Full Auction cases because of the different approaches used to distribute allowances. In the reference case, real electricity prices fall from 7.6 cents per kilowatthour to 7.2 cents per kilowatthour in 2020, and then increase slowly to 7.5 cents per kilowatthour in 2030 as fuel prices rise. In the Phased and Full Auction cases, 2020 electricity prices are, respectively, 4 and 6 percent higher than in the reference case. As the GHG permit price continues to rise between 2020 and 2030 in the Phased and Full Auction cases, the cost of using fossil fuels also continues to grow, contributing to electricity prices that are respectively, 11 and 13 percent above the reference case level in 2030. Electricity prices are slightly lower in the Phased Auction case because a portion of the allowances are given out to power producers for free, lowering the revenue requirements of those producers who are subject to rate regulation. Consumers' total electricity bills in 2020 in the Phased and Full Auction cases are \$10 and \$15 billion (2.9 and 4.4 percent), respectively, higher than in the reference case. By 2030, the increase in consumer bills above the reference case level in the Phased and Full Auction cases grows to \$34 billion and \$41 billion (8.6 and 10.2 percent).

The different regulatory regimes in the various regions of the country do affect the electricity prices in the Phased Auction case. While electricity prices are higher in all regions in both the Phased and Full Auction cases, the price impacts are smaller in the Phased Auction case in regions where prices are set under cost-of-service regulation. For example, in the South Atlantic and Florida regions, 2030 electricity prices are 0.2 cents lower in the Phased Auction case than they are in the Full Auction case. In contrast, in regions where electricity prices are set competitively, the changes relative to the reference case are the same in both the Phased and Full Auction cases.

**Figure 8: Electricity Prices**  
(2004 cents per kilowatthour)



Source: National Energy Modeling System runs AEO2006.D111905A, BL\_FULL7.D112006c, and BL\_PHASED7.D112006b.

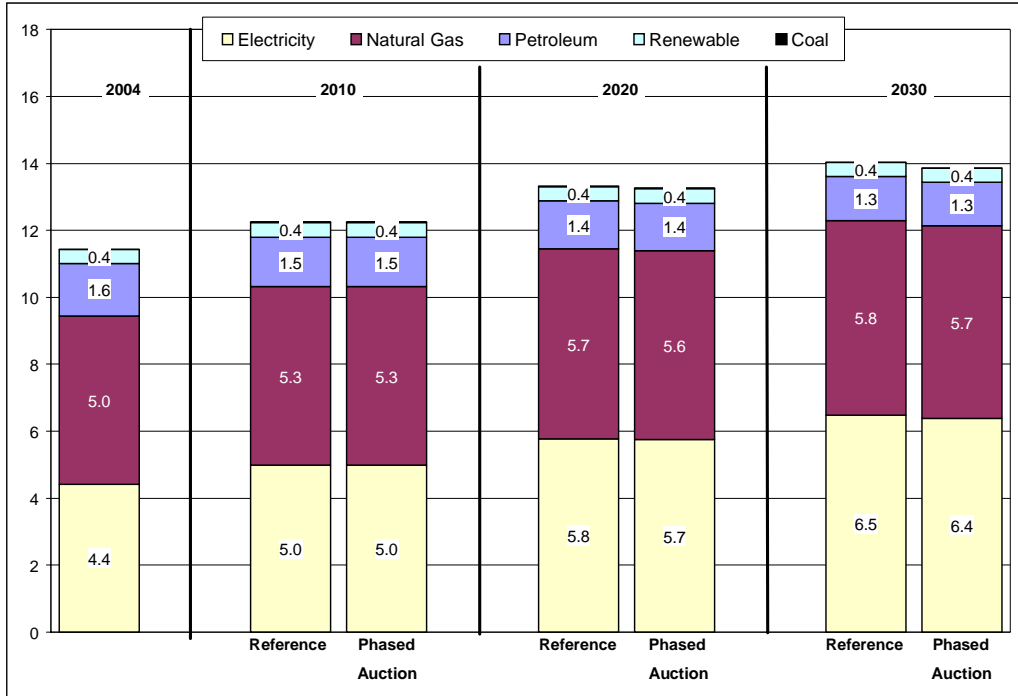
### End-Use Energy Consumption

In response to higher delivered fossil fuel and electricity prices in the Phased and Full Auction cases, consumers and businesses in all sectors of the economy are projected to reduce their energy consumption and, where possible, shift their consumption away from fossil fuels. These changes reduce overall energy consumption, but raise consumers' energy bills.

#### Residential and Commercial

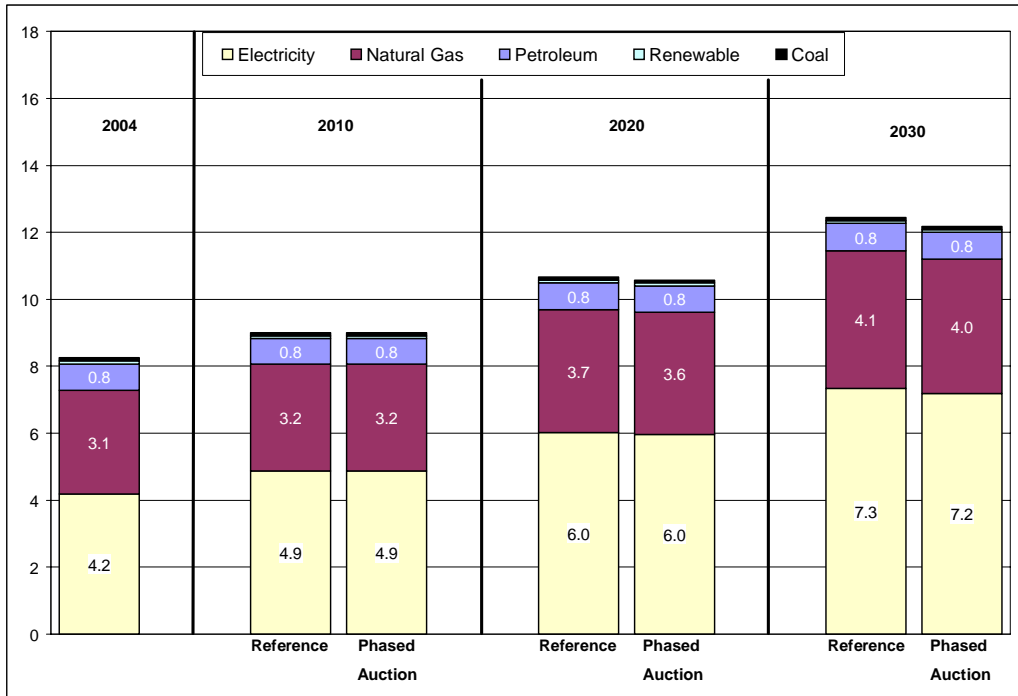
Higher fuel prices under the proposed GHG cap and trade program provide an incentive for residential and commercial consumers to use less energy than otherwise. Relative to the reference case, total delivered residential energy consumption in the Phased Auction case is 0.4 percent lower in 2020, and 1.2 percent lower in 2030 (Figure 9). Similarly, for the commercial sector, total delivered energy consumption in the Phased Auction case is 0.8 percent lower in 2020 and 2.2 percent lower in 2030 (Figure 10).

**Figure 9: Delivered Residential Energy Consumption**  
(quadrillion btu)



Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

**Figure 10: Delivered Commercial Energy Consumption**  
(quadrillion Btu)



Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

These changes result from consumer responses to higher costs for all fossil fuels and electricity in the Phased Auction case. These costs include the purchase price of the fuels together with the costs of permits needed to cover the GHG emissions associated with their use. For example, relative to the reference case, the average delivered price of natural gas is \$0.40 per million Btu (6 percent) higher in 2020 in the Phased Auction case. By 2030, this difference grows to \$0.86 per million Btu (11 percent). For distillate fuel oil and electricity, the projected percentage changes in average prices are similar to those for natural gas.

Even with lower energy consumption, households are projected to see higher energy bills because household energy consumption is relatively unresponsive to energy prices. Compared to the reference case, annual per-household energy expenditures in 2020 are 3 percent (\$41) higher in the Phased Auction case. By 2030, the difference increases, with annual per household energy expenditures 7 percent (\$118) higher in the Phased Auction case.

Where possible, homeowners will increase their use of non-fossil energy. For example, relative to the reference case, the number of homes with solar photovoltaic (PV) systems increases 22 percent in the Phased Auction case by 2030. However, even with a large percentage change, the stock of homes with PV systems remains small. The 22-percent increase results in about 0.1 percent of the homes having PV systems by 2030.

As in the residential sector, the impact of higher energy prices outweighs the impact of reductions in commercial energy consumption, resulting in a \$6-billion (3 percent) increase in commercial energy expenditures in the Phased Auction case in 2020, relative to the reference case. The increase in expenditures is greater by 2030, reaching \$18 billion (8 percent) higher than commercial sector energy expenditures in the reference case in the Phased Auction case.

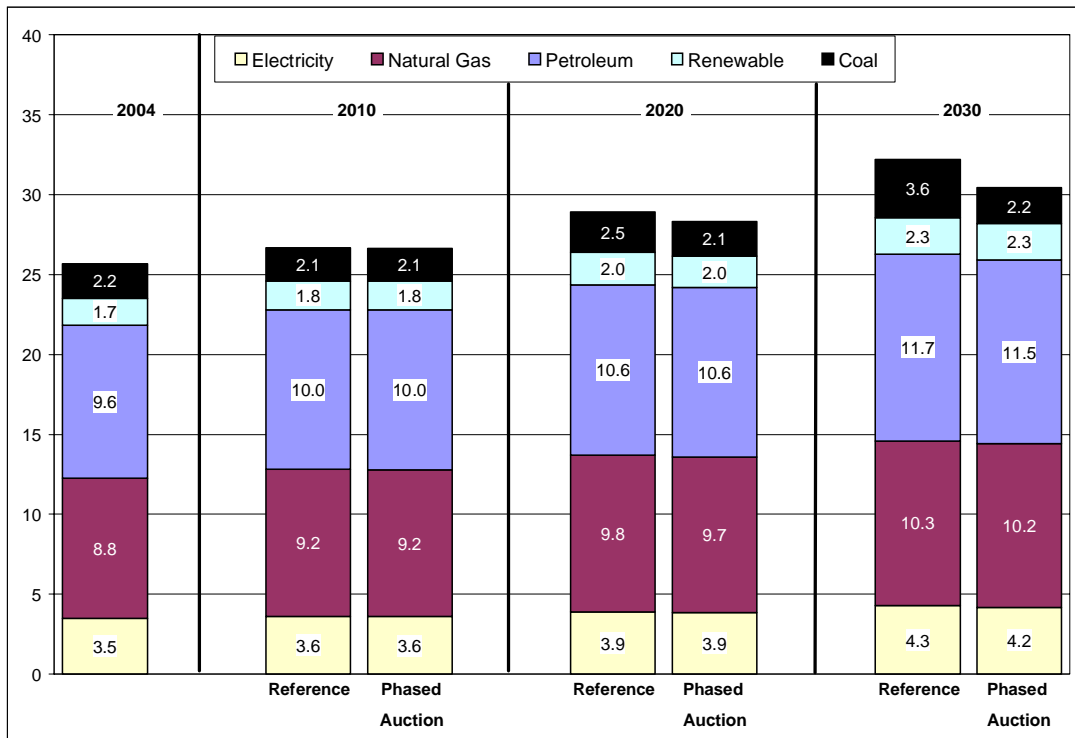
Also, as in the residential sector, commercial consumers are expected to increase their use of renewable energy in response to a GHG cap and trade program. In the Phased Auction case, total commercial sector PV capacity is 5 percent higher in 2020 than in the reference case. By 2030, commercial sector PV capacity in the Phased Auction case is 35 percent higher than in the reference case.

The GHG cap and trade program also stimulates commercial users to increase their investments in natural gas-fired combined heat and power plants (CHP). These facilities can be very efficient, and higher fossil fuel prices make investments in them more attractive. Overall, commercial natural gas-fired CHP capacity is 0.6 percent higher in 2020 in the Phased Auction case, when compared to the reference case. By 2030, the increase relative to the reference case increases to 9 percent.

## Industrial

Industrial consumers also reduce their energy consumption in response to higher energy prices, particularly their consumption of coal, which includes coal used to produce oil and electricity in coal-to-liquids (CTL) plants. Relative to the reference case, delivered industrial energy consumption in the Phased cases is 2 percent lower in 2020 and 6 percent lower in 2030 in the Phased Auction case (Figure 11). The largest percentage reductions occur in coal used in CTL production and purchased electricity. In the *AEO2006* reference case, industrial coal use is projected to grow rapidly in the latter half of the projection as CTL plants are introduced. Under the proposed GHG program policy cases, the cost of coal reduces the economic potential for these plants. Relative to the reference case, total industrial coal use is 15 percent lower in 2020 and 39 percent lower in 2030 in the Phased Auction case. In 2030, the use of coal in CTL plants is lower by nearly 85 percent in the Phased Auction case, and the domestic petroleum supply from CTL plants is about 650 thousand barrels a day lower, compared to the reference case.

**Figure 11: Industrial Energy Consumption**  
(quadrillion Btu)



Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

Compared to the reference case, purchased electricity consumption in the industrial sector is 1 percent lower in 2020 and 3 percent lower in 2030 in the Phased Auction case.

While energy consumption falls in the industrial sector in the Phased Auction case, total industrial energy expenditures rise. Relative to the reference case, industrial energy



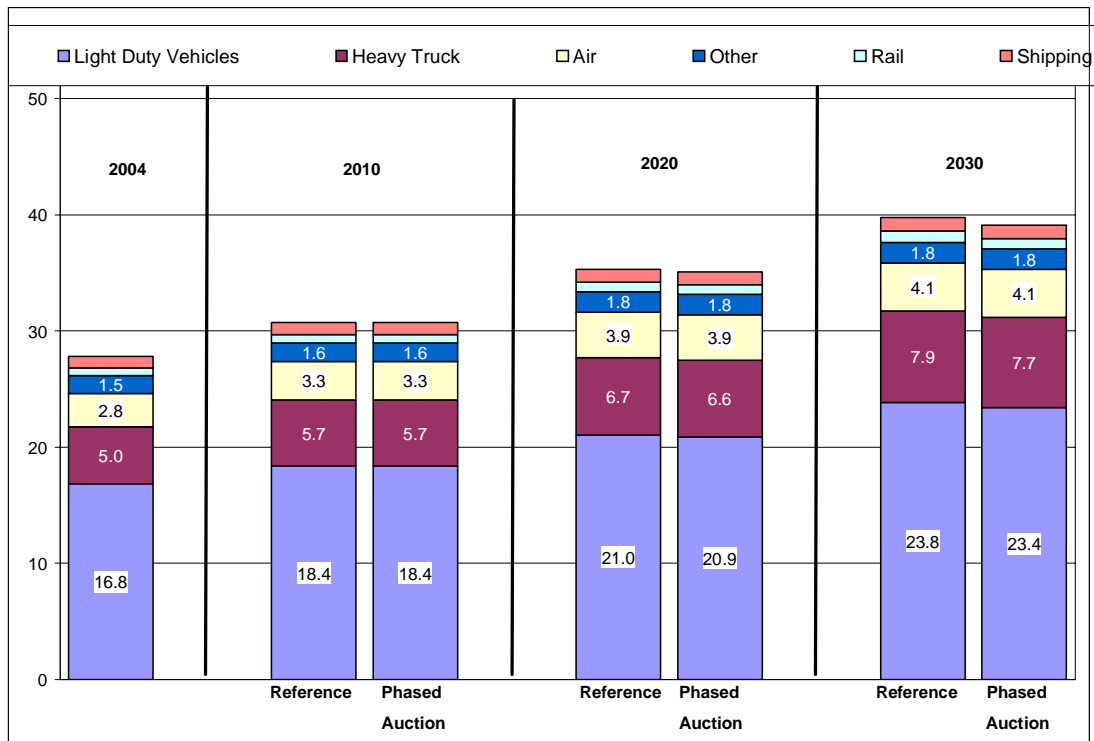
expenditures increase by \$8 billion (5 percent) in 2020 and \$21 billion (10 percent) in 2030, in the Phased Auction case. Industrial output, measured in year 2000 dollars, is also reduced relative to the reference case by \$91 billion (1 percent) in 2030 in the Phased Auction case.

### Transportation

Responding to higher gasoline, diesel, and jet fuel prices, transportation consumers also reduce their energy consumption under the GHG proposal (Figure 12). Relative to the reference case, the higher prices projected in the Phased Auction case lead to 1 percent lower transportation sector energy consumption in 2020 and 2 percent lower transportation sector energy consumption in 2030.

Lower transportation energy consumption results from a combination of reduced travel and increased purchases of more efficient vehicles. In 2020, the reduction in light-duty vehicle miles traveled from the reference case level is 19 billion miles (1 percent) in the Phased Auction case. By 2030, this difference grows to 46 billion miles (1 percent). Freight truck travel is also slightly lower in the Phased Auction case because of lower industrial output.

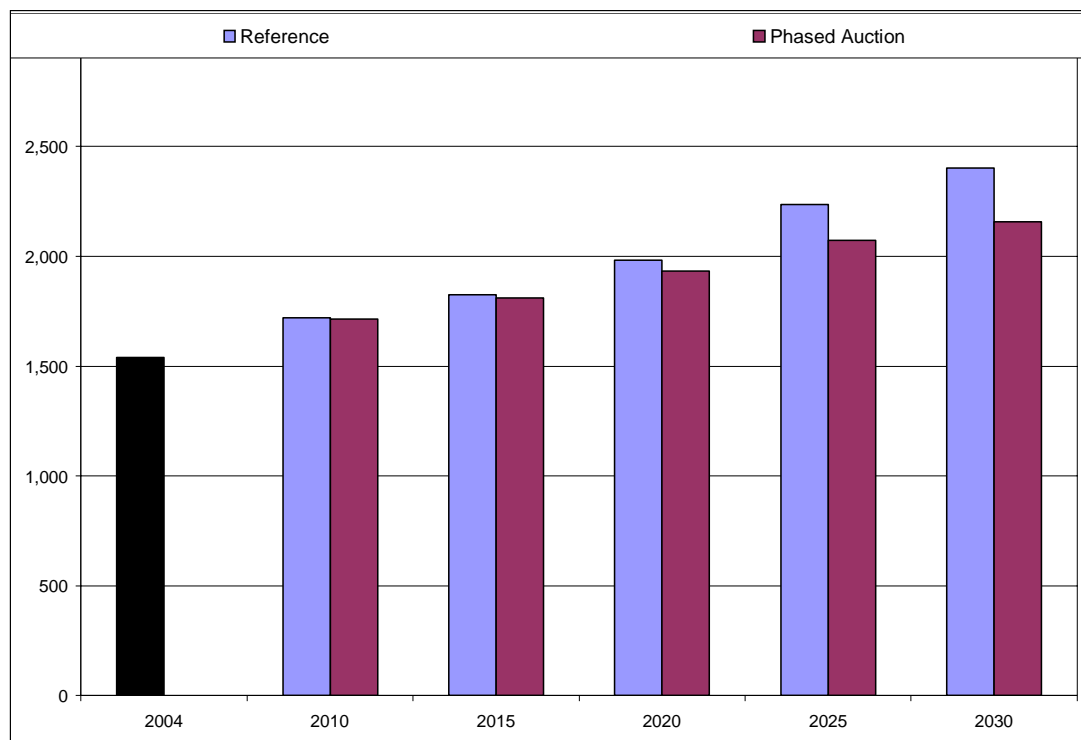
**Figure 12: Transportation Sector Energy Consumption by Mode**  
(quadrillion Btu)



Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

Though energy use by railroads accounts for only a small part of overall transportation energy use, projected growth in railroad shipments is expected to be significantly impacted by large reductions in the projected growth of coal use (Figure 13). Relative to the reference case, 2020 rail ton-miles traveled are 50 billion ton-miles (3 percent) lower in the Phased Auction case. With a growing reduction over time in coal use relative to the reference case, by 2030 rail ton-miles are 245 billion ton-miles (10 percent) lower than in the reference case.

**Figure 13: Railroad Freight Shipments**  
(billion ton miles traveled)



Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

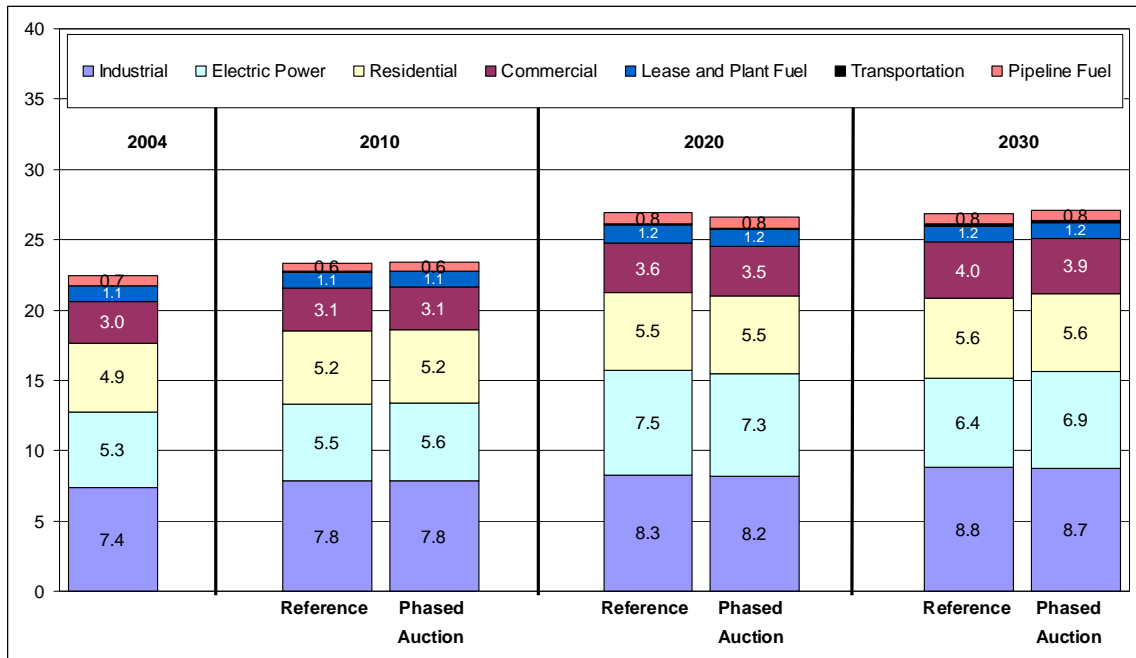
Improved fuel economy also contributes to the lower transportation sector energy consumption. The higher fuel prices in the Phased Auction case stimulate consumers to shift away from light trucks and purchase more hybrid and diesel vehicles. However, the increase in gasoline prices in 2030, \$0.11 per gallon (2004 dollars), is not large enough to stimulate a significant shift in the mix of vehicles purchased. The changes that do occur are gradual, but by 2030, the percent of new light vehicle sales that are cars increases from 45 percent in the reference case to 46 percent in the Phased Auction case. Sales of hybrid vehicles in 2030 grow from 12 percent of new light vehicle sales in the reference case to 11.5 percent of new light vehicle sales in the Phased Auction case. Because of the shift in vehicle purchases in the Phased Auction case, new light-duty vehicle fuel economy is 0.4 miles per gallon (1 percent) higher in 2030 than in the reference case.

## Fuel Supply

### Natural Gas

In general, relative to the reference case, total natural gas consumption changes very little in the Phased and Full Auction cases (Figure 14). The change in consumption occurs mainly in the electric power sector, but most other sectors show small changes. Electric power sector natural gas consumption is projected to be 0.2 quadrillion Btu (2 percent) below the reference case level in the Phased Auction case in 2020 due to reduced total generation requirements. However, by 2030, the pattern reverses itself and electric power sector natural gas consumption is expected to be 0.5 quadrillion Btu (8 percent) higher in the Phased Auction case than in the reference case.

**Figure 14: Natural Gas Consumption by Sector**  
(trillion cubic feet)



Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

### Coal

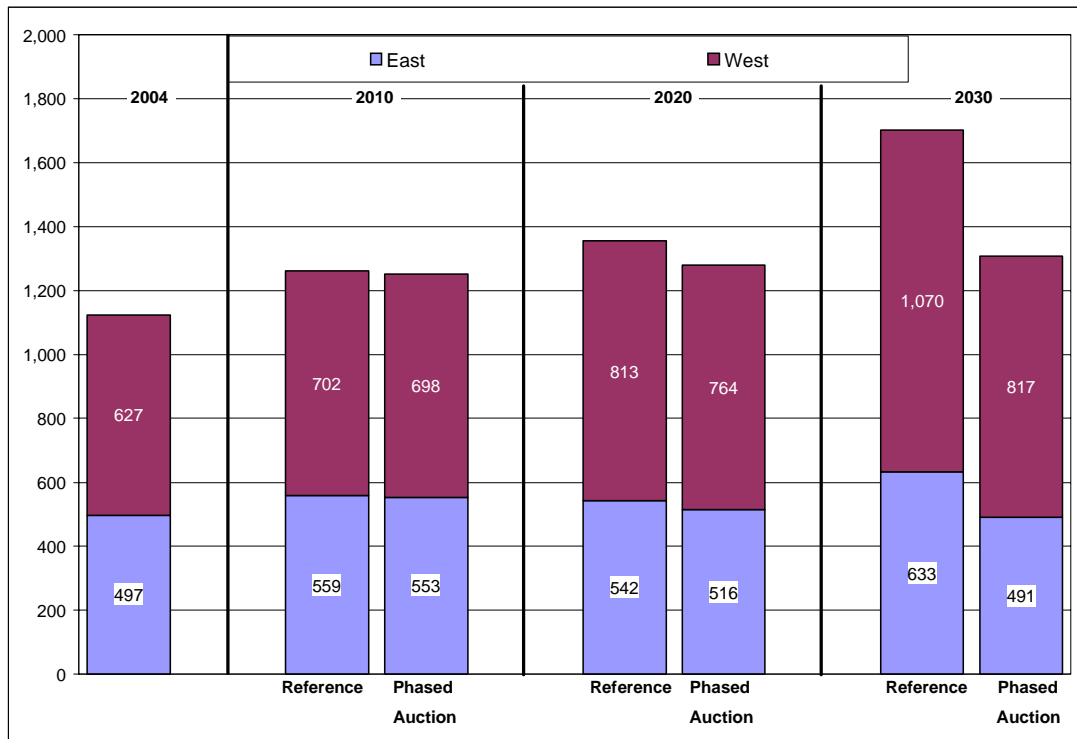
Because of large reductions in coal use in the electric power sector and in the production of liquid fuels, coal production is much lower in the Phased Auction case (Figure 15). Relative to the reference case, total coal production is 73 million tons (5 percent) lower in 2020 and 383 million tons (22 percent) lower in 2030 in the Phased Auction case. However, even with these changes, coal production in 2030 in the Phased Auction case is projected to be 17 percent (196 million tons) greater than 2004 production. Both eastern and western coal production are lower in the Phased Auction case, but the impact is

larger in the west because that is where coal production is projected to grow most rapidly in the reference case.

## Petroleum

Relative to the reference case, the consumption of petroleum products is lower in the Phased Auction case, as consumers respond to the higher delivered petroleum product prices that result from cost of allowances under the cap-and-trade program. Petroleum consumption in 2020 is projected to be 0.4 million barrels per day (2 percent) lower in the Phased Auction case than in the reference case. By 2030 the difference grows to 0.7 million barrels per day (3 percent) lower in the Phased Auction case than in the reference case. However, domestic crude oil production is relatively unaffected because the world crude oil prices are unchanged. The reduction in petroleum supply in the Phased Auction case comes from reductions in imports and reductions in domestic CTL production. In the Phased Auction case in 2020, CTL production is 0.2 million barrels per day (74 percent) lower than in the reference case. By 2030, the change is 0.6 million barrels per day (85 percent) lower than in the reference case. The cost of allowances increases the cost of using coal, making CTL production much less competitive with imported and domestic oil.

**Figure 15: Coal Production**  
(million short tons)



Source: National Energy Modeling System runs AEO2006.D111905A and BL\_PHASED7.D112006b.

## Economic Impacts

Implementing a GHG emissions cap-and-trade program based on a targeted rate of reduction in emissions intensity in which some emissions permits will be auctioned and others will be sold if the safety valve is triggered will impact the economy through two mechanisms. First, efforts to reduce GHG emissions and the requirement to hold permits for all remaining GHG emissions will raise energy prices, particularly those for fossil fuels. Second, the auctioning of permits and the sale of additional permits if the safety valve is triggered will increase revenues to the government. In turn, higher energy prices and increased government revenues will impact aggregate economic growth.

### Government Revenues

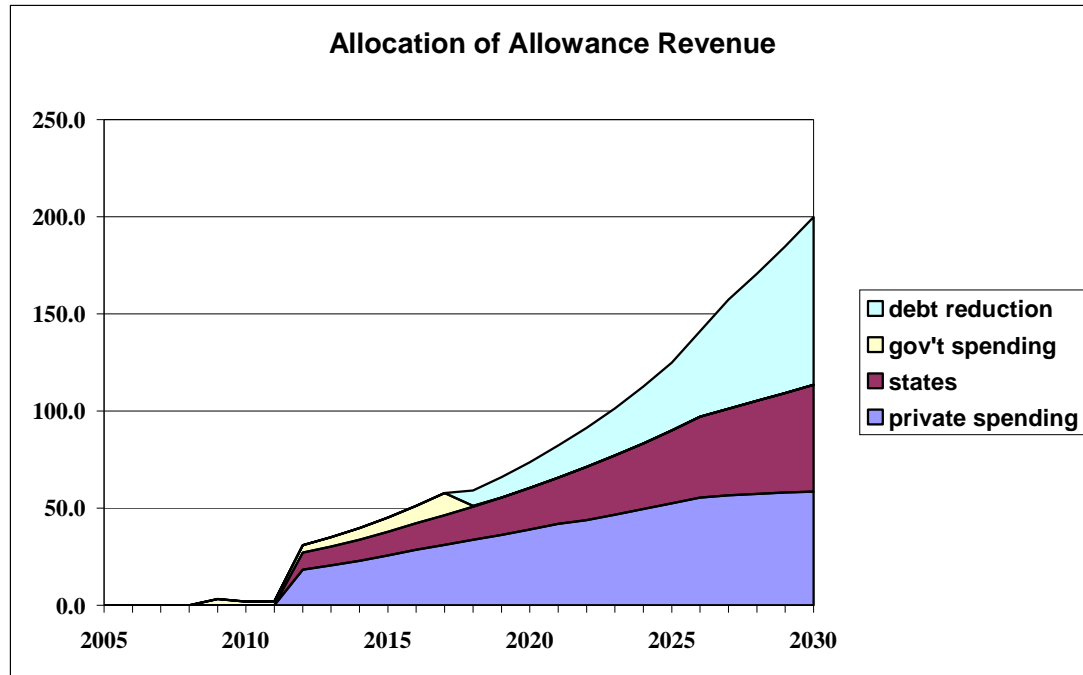
Projected government revenue from the allowance program is a function of the market price of the allowances, the number of initial allowances auctioned, and the additional revenue from safety valve fees. The value of allowances allocated for free can be considered a revenue transfer in the sense that recipients will accrue revenue from the resale of these allowances. For simplicity in the following discussion, free allowance allocation from the Federal government to recipients is treated as a revenue transfer.

The auctioning of allowances and their free distribution under the proposal will result in revenue flows to different sectors of the economy. Industry will presumably apply some of the value of allowances allocated to them to implement energy-saving processes and technologies. States will use the funds for a variety of programs, such as addressing economic impacts and promoting technology or energy efficiency. As specified in the proposal, the revenue generated by the Federal government (auction proceeds plus safety-valve fees) is initially used to fund early technology deployment, subject to a \$50-billion cap on the maximum cumulative deposits to the trust fund. This limit is projected to be reached in 2017 in the Phased Auction case, after which all remaining revenue flows to the U.S. Treasury and is assumed to be used to retire some part of the Federal debt. Figure 16 shows the flows of these funds among the various sectors for the Phased Auction case. The projected change in the Federal deficit relative to the reference case differs from the amount of allowance revenue allocated to debt reduction due to the impact of the proposed program on the overall economy.

The Full Auction case considers the effects of a policy of letting *all* of the allowance receipts flow to the Federal government as an alternative to the allocation scheme in the proposal. The Federal expenditure profile for revenue deposited in the Climate Change Trust Fund is assumed to be the same as in the Phased Auction case. The difference in the two cases is the impact on funds flowing to the Federal government and the subsequent rate at which the Federal debt level is lowered (Figure 17). In essence, the Full Auction case draws more money away from the spending stream of the economy and thus lowers aggregate demand to a much larger degree than the Phased Auction case. Some discussion of possible alternative approaches to revenue recycling and their

implications is provided in an earlier EIA report requested by Senators Inhofe, McCain, and Lieberman<sup>21</sup>

**Figure 16: Allocation of Allowance Revenue in the Phased Auction Case**  
(billion nominal dollars)



Source: National Energy Modeling System run, BL\_PHASED7.D112006b.

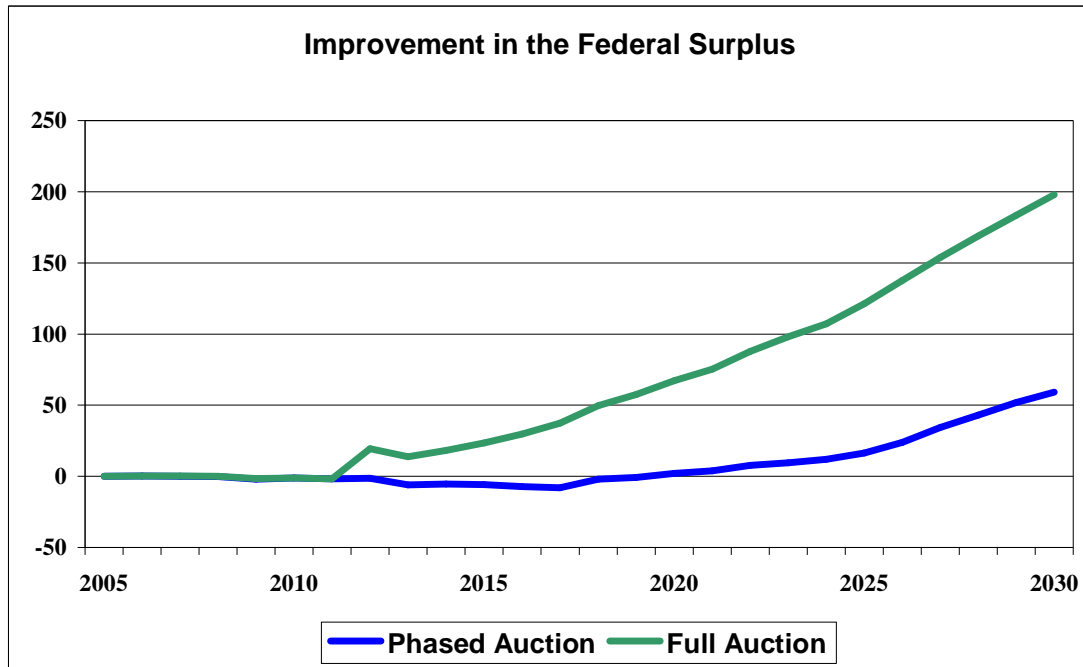
## Prices

The energy market impacts of the proposed program influence the aggregate economy through the effect on prices and energy expenditures. Figure 18 shows the percentage changes in the consumer price index (CPI) for energy and the All-Urban CPI, a measure of aggregate consumer prices in the economy. The CPI for energy, a summary measure of energy prices facing households at the retail level incorporating the energy price impacts associated with rising petroleum, natural gas, and electricity prices, increases by approximately 8 percent above the reference case level by 2030. Ultimately the consumer sees higher prices directly through final prices paid for energy goods and service, plus higher prices for other goods and services that come about due to changes in the price of other goods and services resulting from energy price changes, as well as changes in interest rates and other prices driven by the flow of revenues to the government and other sectors under the proposal.

In the Phased Auction case, the All-Urban CPI rises steadily and by 2030 is approximately one percent above the reference case. In the Full Auction case, both

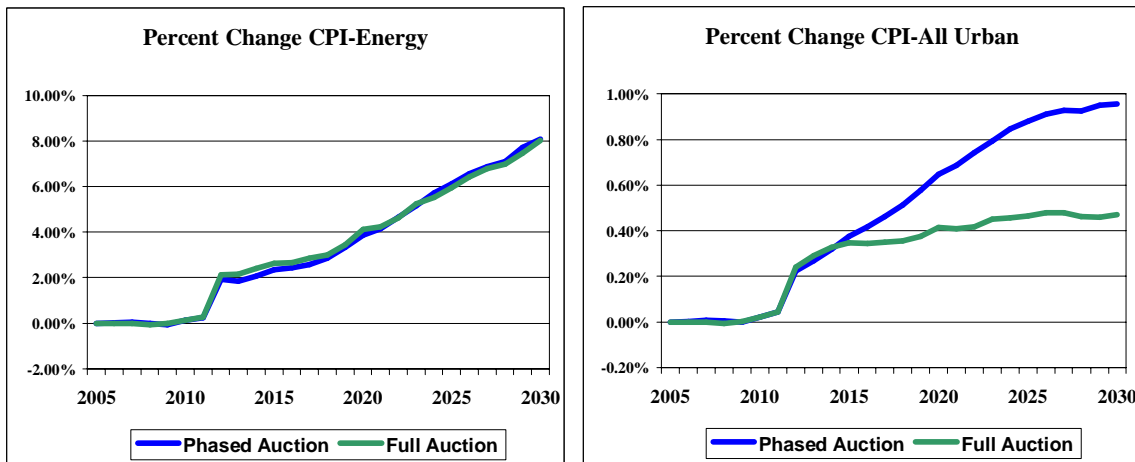
<sup>21</sup> Energy Information Administration, *Analysis of S.139, the Climate Stewardship Act of 2003*, SR/OIAF/2003-02 (Washington, DC, June 2003) web site [http://www.eia.doe.gov/oiaf/servicert/ml/pdf/sroiaf\(2003\)02.pdf](http://www.eia.doe.gov/oiaf/servicert/ml/pdf/sroiaf(2003)02.pdf).

**Figure 17: Projected Improvement in the Federal Surplus**  
(billion nominal dollars)



Source: National Energy Modeling System runs BL\_FULL7.D112006c, and BL\_PHASED7.D112006b.

**Figure 18: Impacts on the CPI for Energy and the All Urban CPI**  
(percent change from reference case)



Source: National Energy Modeling System runs BL\_FULL7.D112006c, and BL\_PHASED7.D112006b.

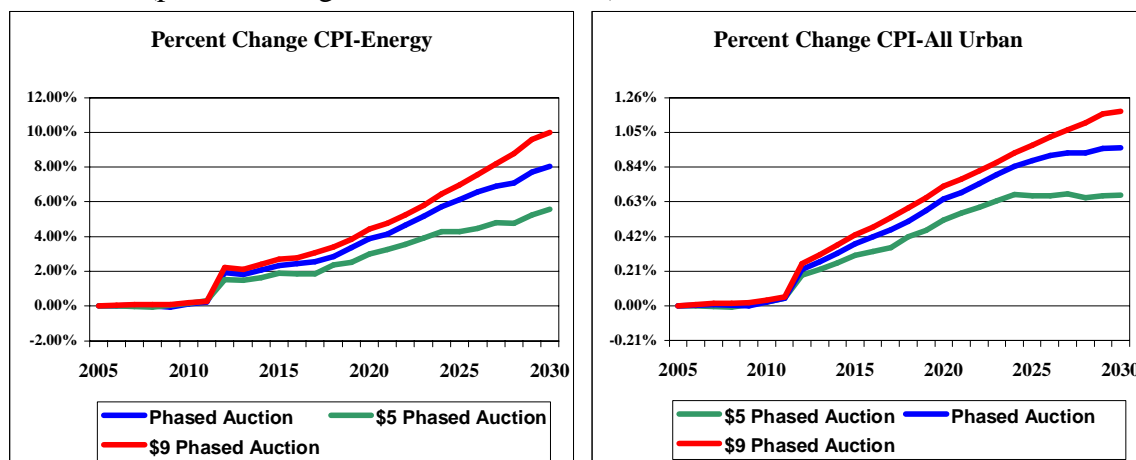
interest rates and aggregate demand are lower. Interest rates are lower for two main reasons. First, there is less inflationary pressure due to lower aggregate demand and the slightly higher unemployment. Second, with a lower government deficit there is less demand for credit. With less inflationary pressure, the Full Auction variant of the proposal has a lesser effect on the All-Urban CPI than the Phased Auction version. This

result implies that energy prices are higher relative to the prices of other goods in the Full Auction case than in the Phased Auction case.

The alternative values of the safety valve price considered in the sensitivity cases will have relatively symmetric impacts on aggregate prices. Figure 19 shows that the All-Urban CPI will rise to approximately 1.2 percent above the reference case by 2030 in the Phased \$9 case compared to a 1.0-percent increase in the Phased Auction case.

**Figure 19: Impacts on the CPI for Energy and the All Urban CPI with Alternative Safety Valves**

(percent change from reference case)



Source: National Energy Modeling System runs AEO2006.D111905A, BL\_PHASED7.D112006B, BL\_PHASED5.D111306A, and BL\_PHASED9.D112006B.

## Real GDP and Consumption Impacts<sup>22</sup>

The higher delivered energy prices and the collection of additional government revenues lower real output for the economy in both the Phased and Full Auction cases. They reduce energy consumption, but also indirectly reduce real consumer spending for other goods and services due to lower purchasing power. The lower aggregate demand for goods and services in the both the Phased and Full Auction cases results in lower real GDP relative to the reference case (Figure 20). Relative to the reference case, total discounted GDP over the 2009 to 2030 time period is \$232 billion (0.10 percent) lower in the Phased Auction case and \$462 billion (0.19 percent) lower in the Full Auction case. Projected GDP impacts generally increase over time, as the cap-and-trade program requires larger changes in the energy system. Relative to the reference case, real GDP in 2030 is \$59 billion (0.26 percent) lower in the Phased Auction case and \$94 billion (0.41 percent) lower in the Full Auction case. Because the additional impact on economic activity under a Full Auction could be significantly, or even fully, mitigated under alternative revenue recycling assumptions, the results for the Full Auction case presented

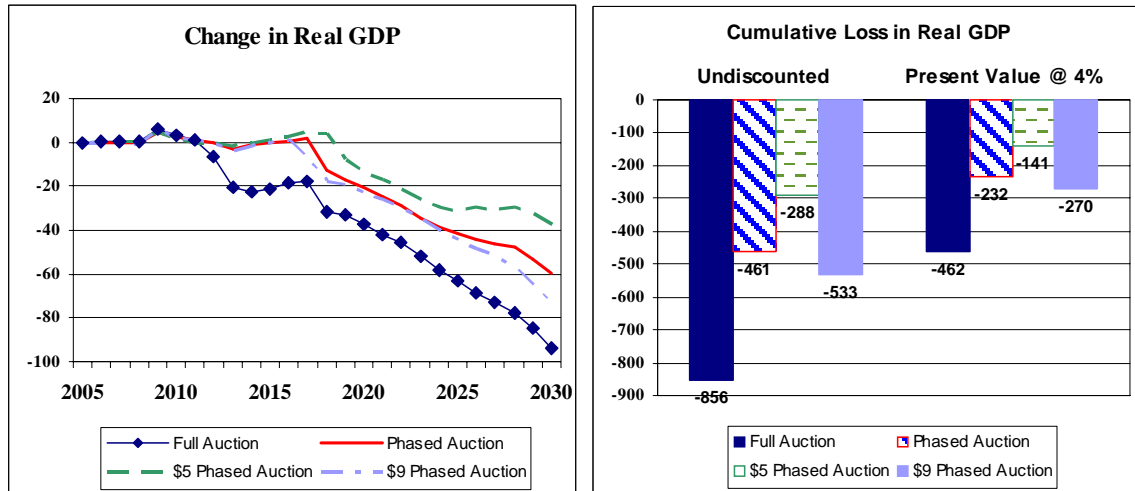
<sup>22</sup> All dollar values reported in this section and beyond are expressed in real 2000 dollars unless otherwise stated



here should not be construed as suggesting a general conclusion that a Phased Auction will necessarily result in lesser impacts on GDP than a comparable Full Auction.

The alternative values of the safety valve price considered in the sensitivity cases have relatively symmetric impacts on projected GDP losses. The estimated loss in GDP in 2030 is 0.32 percent in the Phased \$9 case, compared to 0.26 percent for the Phased Auction case and 0.16 percent for the Phased \$5 case. In terms of cumulative GDP losses, the difference between the Phased Auction and Phased \$9 cases is much smaller, 0.10 percent compared to 0.11 percent, reflecting the fact that the safety valve does not become binding until after 2025 in the Phased Auction case, so that economic impacts up to that date follow the same path in either case. Under the Phased \$5 case, the safety valve comes into play at an earlier date, so there is a longer period of time over which projected economic impacts differ from those in the Phased Auction case.

**Figure 20: GDP Impacts**  
(billion 2000 dollars)



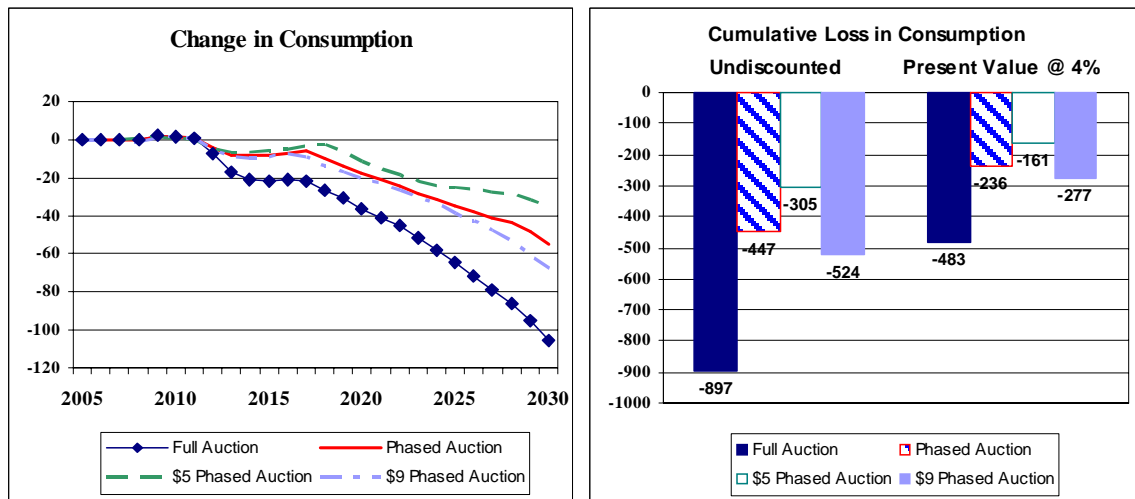
Source: National Energy Modeling System runs AEO2006.D111905A, BL\_PHASED7.D112006B, BL\_PHASED5.D111306A, and BL\_PHASED9.D112006B.

While real GDP is a measure of what the economy produces, ultimately consumers are interested in their purchases of goods and services. GDP and consumption impacts of a proposed policy can differ if the policy leads to changes in the shares of the GDP components, which include consumption, investment, government expenditures, and net exports, as well as the level of GDP. Figure 21 shows two measures of consumption impacts: the change in consumption relative to the reference case and the cumulative discounted loss in consumption over the 2009 to 2030 period. Cumulative discounted consumption losses relative to the reference case are \$236 billion (0.14 percent) in the Phased Auction case and \$483 billion (0.29 percent) in the Full Auction case. Consumption impacts, like GDP impacts, generally grow over time. In 2030, projected real consumption in the Phased Auction and Full Auction case is, respectively, \$55 billion (0.36 percent) and \$106 billion (0.69 percent) below the reference case level. Starting from the Phased Auction case in which the safety valve is binding before the end of the modeled time horizon, a lower initial value for the safety valve lowers estimated

consumption losses, while a higher safety valve raises them (Figure 21). In terms of cumulative discounted consumption losses over the 2010 to 2030 period, the impact of the \$5 Phased Auction and \$9 Phased Auction sensitivity cases on consumption losses is somewhat asymmetric relative to the \$236 billion estimated cumulative discounted consumption loss in the Phased Auction case. The \$5 Phased Auction case lowers the estimated cumulative discounted consumption loss to \$161 billion (0.10 percent), while the \$9 Phased Auction case raises it to \$277 billion (0.17 percent).

Table 3 provides more detail on the two main Auction cases.

**Figure 21: Consumption Impacts**  
(billion 2000 dollars)



Source: National Energy Modeling System runs AEO2006.D111905A, BL\_PHASED7.D112006B, BL\_PHASED5.D111306A, and BL\_PHASED9.D112006B.

**Table 3: Economic Impacts of Phased and Full Auction Cases**

Projection	2004	2020			2030		
		AEO2006 Reference	Phased Auction	Full Auction	AEO2006 Reference	Phased Auction	Full Auction
<b>Allocation of Allowance Revenue (billion nominal dollars)</b>							
Private Spending	-	-	39.0	0.0	-	58.6	0.0
States	-	-	21.4	0.0	-	54.9	0.0
Government Spending	-	-	0.0	0.0	-	0.0	0.0
Debt Reduction	-	-	13.3	73.7	-	86.4	199.9
Total Revenue	-	-	73.7	73.7	-	199.9	199.9
<b>Aggregate Prices in the Economy</b>							
WPI – Fuel & Power (1982 =1.0)	1.27	1.77	1.88	1.88	2.49	2.79	2.79
CPI – Energy (1982/84 = 1.0)	1.51	2.19	2.27	2.28	2.96	3.20	3.20
CPI – All Urban (1982/84 = 1.0)	1.89	2.86	2.88	2.87	3.78	3.82	3.80
<b>Inflation Rate, Unemployment Rate and the Federal Funds Rate (percent)</b>							
Inflation	2.68	3.06	3.13	3.10	2.67	2.68	2.68
Unemployment Rate	5.53	4.37	4.44	4.46	4.90	5.01	5.02
Federal Funds Rate	1.35	5.24	5.24	5.16	5.04	4.96	4.86
<b>Components of GDP (billion 2000 dollars)</b>							
GDP	10,756	17,541	17,520	17,503	23,112	23,053	23,018
Disposable Income	8,004	13,057	13,037	12,991	17,562	17,468	17,367
Consumption	7,589	11,916	11,898	11,880	15,352	15,298	15,247
Investment	1,810	3,293	3,291	3,288	4,985	4,990	4,973
Government	1,952	2,464	2,474	2,464	2,838	2,861	2,839
Exports	1,118	3,776	3,759	3,765	6,833	6,785	6,813
Imports	1,719	3,659	3,660	3,647	6,156	6,165	6,121

Source: National Energy Modeling System runs AEO2006.D111905A, BL\_FULL7.D112006c, and BL\_PHASSED7.D112006b.

## 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, particularly when those changes are fairly dramatic. This analysis suggests that, to comply with the GHG emissions growth limits necessary to meet the intensity reduction targets, all energy providers, particularly electricity producers, will increasingly rely on technologies that play a relatively small role today or have not been built in the United States in many years. Sensitivity analyses included in previous EIA studies of cap-and-trade systems for GHG show that estimates of both energy and economic impacts of such programs can change significantly under alternative assumptions regarding the cost and availability of new technologies.

Non-hydroelectric renewable generators currently provide 2.2 percent of the electricity generated. In the reference case, their share is expected to grow to 4.3 percent in 2030. In the Phased and Full Auction cases their share grows to 9 and 10 percent of generation by 2030. While this level of growth is certainly possible, particularly since the GHG emission targets are tightened gradually, it comes with some uncertainty. It is possible that such growth might lead to significant reductions in the costs of these technologies. On the other hand, it is also possible that costly hurdles such as siting resistance, higher than expected transmission interconnection costs, or fuel supply limits could arise that limit their development.

Similarly, this analysis suggests that the power sector would significantly increase its reliance on nuclear power in order to reduce GHG emissions. This is despite the facts that the last nuclear order in the United States was placed in 1978 and the last nuclear plant to enter service began operating in 1996. However, several factors, including rising fossil fuel prices, concern about GHG emissions, tax incentives in the EPACT 2005 and new nuclear plant designs, have recently spurred renewed interest in new nuclear plants. In the reference case, nuclear capacity is projected to increase by 9 gigawatts, including 3 gigawatts of uprates at existing plants and 6 gigawatts of new nuclear plants, about 4 to 6 new plants. In the Phased and Full Auction cases, nuclear capacity is projected to grow by 48 gigawatts and 46 gigawatts, respectively. Such growth in nuclear power might lead to significant cost reductions, encouraging more expansion than projected. On the other hand, costly hurdles, such as unexpectedly high construction costs, public resistance to the siting of facilities, or waste disposal concerns, could arise to limit their development.

If the development of these technologies is limited for one reason or another, power providers will have two choices. First, they can turn to other low-GHG or non-GHG technologies, such as new fossil generators with carbon capture and sequestration equipment, that play a fairly small role in today's market. Second, they can comply by paying more safety-valve fees to maintain their reliance on current fossil-fired generation. To the extent this occurs, projected reductions in GHGs would be reduced. One way or another, significantly reducing energy-related GHG emissions would require a shift away from fossil energy sources that accounted for 86 percent of U.S. energy consumption in 2004. The costs of such a shift are inherently uncertain.

Particularly uncertain in this analysis is the role that increased research and development (R&D) expenditures might play in spurring the development and deployment of new more efficient, lower emitting technologies. The draft proposal calls for spending significant resources on R&D, but it is impossible to predict the impact of such expenditures.

A final source of uncertainty involves assumptions regarding the availability of reductions in covered GHG emissions outside the energy sector. To the extent that this analysis overstates the availability of such reductions, additional reductions in emissions within the energy sector or additional purchases of allowances at the applicable safety valve price would be required to comply with the proposed program. Previous studies have explored the sensitivity of energy and economic impact estimates to alternative estimates of available emissions reductions outside the energy sector.

## **Appendix A. Analysis Request Letter**

United States Senate  
WASHINGTON, DC 20510

September 27, 2006

The Honorable Guy F. Caruso  
Administrator  
Energy Information Administration  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, DC 20585

Dear Mr. Caruso:

Over the past 18 months the Energy Information Administration (EIA) has completed two reports analyzing variations of a greenhouse gas emission trading system as proposed by the National Commission on Energy Policy (NCEP). The first, completed in April 2005, examined NCEP's original proposal, while the second report, undertaken at the request of Senator Salazar and released in March 2006, built on EIA's previous work and analyzed a range of greenhouse gas intensity targets and safety valve levels for an emission trading system.

Both of these studies have proven extremely valuable to us and other members of the Senate as we continue to explore options for addressing global climate change. Over the past year, the Senate Committee on Energy and Natural Resources has held hearings and convened a day-long Climate Conference to examine the approaches analyzed by EIA in more detail. In order to continue this process, Senator Bingaman has drafted a proposal in consultation with other Congressional offices and interested stakeholders. We are requesting EIA analyze this proposal.




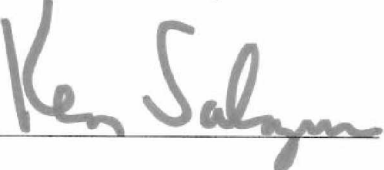

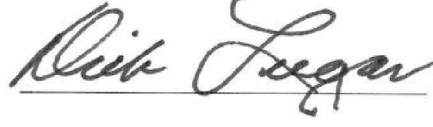
Two variants of this proposal should be included in the analysis. The first scenario should assume that no allowances are allocated freely so that we can have an understanding of the cost impacts experienced throughout the economy. The second scenario should assume that allowances are allocated as specified in the draft proposal.

The analysis should use the AEO 2006 reference case (the same reference case used for the March 2006 report) for its "business-as-usual" case. We also ask that you provide us with a short memo that compares the results of the original NCEP proposal as modeled in the March 2006 report ("cap\_trade\_1") with the results of this scenario.

The Honorable Guy F. Caruso, EIA  
Page 2

Thank you for assistance with this report. In order to obtain an analysis that will fulfill our needs, we would like to request you meet with Jonathan Black in Senator Bingaman's office.

Sincerely,

 _____	 _____
 _____	 _____
 _____	 _____
_____	_____



## **Appendix B. Draft Bill Language**

Title: To manage the carbon content of United States domestic energy supply.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

## SECTION 1. SHORT TITLE.

This Act may be cited as the “\_\_\_\_\_ Act of \_\_\_\_”.

## SEC. 2. ACTIONS TO ADDRESS GLOBAL CLIMATE.

Title XVI of the Energy Policy Act of 1992 (42 U.S.C. 13381 et seq.) is amended—

(1) by inserting after the title designation and heading the following:

“Subtitle A—General Provisions”;

and

(2) by adding at the end the following:

“Subtitle B—Actions to Address Global Climate Change

“SEC. 1611. PURPOSE.

“The purpose of this subtitle is to reduce greenhouse gas emissions intensity in the United States, beginning in calendar year 2012, through an emissions trading system designed to achieve emissions reductions at the lowest practicable cost to the United States.

“SEC. 1612. DEFINITIONS.

“In this subtitle:

“(1) CARBON DIOXIDE EQUIVALENT.—The term ‘carbon dioxide equivalent’ means—

“(A) for each covered fuel, the quantity of carbon dioxide that would be emitted into the atmosphere as a result of complete combustion of a unit of the covered fuel, to be determined for the type of covered fuel by the Secretary; and

“(B) for each greenhouse gas (other than carbon dioxide) the quantity of carbon dioxide that would have an effect on global warming equal to the effect of a unit of the greenhouse gas, as determined by the Secretary, taking into consideration global warming potentials.

“(2) COVERED FUEL.—The term ‘covered fuel’ means—

“(A) coal;

“(B) petroleum products;

“(C) natural gas;

“(D) natural gas liquids; and

“(E) any other fuel derived from fossil hydrocarbons (including bitumen and kerogen).

“(3) COVERED GREENHOUSE GAS EMISSIONS.—

“(A) IN GENERAL.—The term ‘covered greenhouse gas emissions’ means—

“(i) the carbon dioxide emissions from combustion of covered fuel carried out in the United States; and

“(ii) nonfuel-related greenhouse gas emissions in the United States, determined in accordance with section 1615(b)(2).

“(B) UNITS.—Quantities of covered greenhouse gas emissions shall be measured and expressed in units of metric tons of carbon dioxide equivalent.

“(4) EMISSIONS INTENSITY.—The term ‘emissions intensity’ means, for any calendar year, the quotient obtained by dividing—

“(A) covered greenhouse gas emissions; by

“(B) the forecasted GDP for that calendar year.

“(5) FORECASTED GDP.—The term ‘forecasted GDP’ means the predicted amount of the gross domestic product of the United States, based on the most current projection used by the Energy Information Administration of the Department of Energy on the date on which the prediction is made.

“(6) FORECASTED GDP IMPLICIT PRICE DEFLATOR.—The term ‘forecasted GDP implicit price deflator’ means [TO BE SUPPLIED].

“(7) GREENHOUSE GAS.—The term ‘greenhouse gas’ means—

“(A) carbon dioxide;

“(B) methane;

“(C) nitrous oxide;

“(D) hydrofluorocarbons;

“(E) perfluorocarbons; and

“(F) sulfur hexafluoride.

“(8) INITIAL ALLOCATION PERIOD.—The term ‘initial allocation period’ means the period beginning January 1, 2012, and ending December 31, 2021.

[“(9) NATURAL GAS PROCESSING PLANT.—The term ‘natural gas processing plant’ means a facility designed to separate natural gas liquids from natural gas.]

“(10) NONFUEL REGULATED ENTITY.—The term ‘nonfuel regulated entity’ means—

“(A) the owner or operator of a facility that manufactures

hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, or nitrous oxide;

“(B) an importer of hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, or nitrous oxide;

“(C) the owner or operator of a facility that emits nitrous oxide associated with the manufacture of adipic acid or nitric acid;

“(D) the owner or operator of an aluminum smelter;

“(E) the owner or operator of an underground coal mine that emitted more than 35,000,000 cubic feet of methane during 2004 or any subsequent calendar year; and

“(F) the owner or operator of facility that emits hydrofluorocarbon-23 as a byproduct of hydrochlorofluorocarbon-22 production.

“(11) OFFSET PROJECT.—The term ‘offset project’ means any project to—

“(A) reduce greenhouse gas emissions; or

“(B) sequester a greenhouse gas.

“(12) PETROLEUM PRODUCT.—The term ‘petroleum product’ means—

“(A) a refined petroleum product;

“(B) residual fuel oil;

“(C) petroleum coke; or

“(D) a liquefied petroleum gas.

“(13) REGULATED ENTITY.—The term ‘regulated entity’ means—

“(A) a regulated fuel distributor; or

“(B) a nonfuel regulated entity.

“(14) REGULATED FUEL DISTRIBUTOR.—The term ‘regulated fuel distributor’ means—

“(A) the owner or operator of—

“(i) a petroleum refinery;

“(ii) a coal mine that produces more than 10,000 short tons during 2004 or any subsequent calendar year; or

“(iii) a natural gas processing plant [size threshold];

“(B) an importer of—

“(i) petroleum products;

“(ii) coal;

“(iii) coke; or

“(iv) natural gas liquids; or

“(C) any other entity the Secretary determines under section

1615(b)(3)(A)(ii) to be subject to section 1615.

“(15) SAFETY VALVE PRICE.—The term ‘safety valve price’ means—

“(A) for 2012, \$7 per metric ton of carbon dioxide equivalent; and

“(B) for each subsequent calendar year, an amount equal to the product obtained by multiplying—

“(i) the safety valve price established for the preceding calendar year increased by 5 percent, unless a different rate of increase is established for the calendar year under section 1622; and

“(ii) the ratio that—

“(I) the forecasted GDP implicit price deflator for the calendar year; bears to

“(II) the forecasted GDP implicit price deflator for the preceding calendar year.

“(16) SECRETARY.—The term ‘Secretary’ means the Secretary of Energy, unless the President designates another officer of the Executive Branch to carry out a function under this subtitle.

“(17) SUBSEQUENT ALLOCATION PERIOD.—The term ‘subsequent allocation period’ means—

“(A) the 5-year period beginning January 1, 2022, and ending December 31, 2026; and

“(B) each subsequent 5-year period.

## “SEC. 1613. QUANTITY OF ANNUAL GREENHOUSE GAS ALLOWANCES.

“(a) Initial Allocation Period.—

“(1) IN GENERAL.—Not later than December 31, 2008, the Secretary shall—

“(A) make a projection with respect to emissions intensity for 2011, using—

“(i) the Energy Information Administration’s most current projections of covered greenhouse gas emissions for 2011; and

“(ii) the forecasted GDP for 2011;

“(B) determine the emissions intensity target for 2012 by calculating a 2.6 percent reduction from the projected emissions intensity for 2011;

“(C) in accordance with paragraph (2), determine the emissions intensity target for each calendar year of the initial allocation period after 2012; and

“(D) in accordance with paragraph (3), determine the total number of allowances to be allocated for each calendar year during the initial allocation period.

“(2) EMISSIONS INTENSITY TARGETS AFTER 2012.—For each calendar year during the initial allocation period after 2012, the emissions intensity target shall be the emissions intensity target established for the preceding calendar year reduced by 2.6 percent.

“(3) TOTAL ALLOWANCES.—For each calendar year during the initial allocation period, the quantity of allowances to be issued shall be equal to the product obtained by multiplying—

“(A) the emissions intensity target established for the calendar year; and

“(B) the forecasted GDP for the calendar year.

“(b) Subsequent Allocation Periods.—

“(1) IN GENERAL.—Not later than the date that is 4 years before the beginning of each subsequent allocation period, the Secretary shall—

“(A) except as directed under section 1622, determine the emissions intensity target for each calendar year during that subsequent allocation period, in accordance with paragraph (2); and

“(B) issue the total number of allowances for each calendar year of the subsequent allocation period, in accordance with paragraph (3).

“(2) EMISSIONS INTENSITY TARGETS.—For each calendar year during a subsequent allocation period, the emissions intensity target shall be the emissions intensity target established for the preceding calendar year reduced by 3.0 percent.

“(3) TOTAL ALLOWANCES.—For each calendar year during a subsequent allocation period, the quantity of allowances to be issued shall be equal to the product obtained by multiplying—

“(A) the emissions intensity target established for the calendar year; and

“(B) the forecasted GDP for the calendar year.

“(c) Administrative Requirements.—

“(1) DENOMINATION.—Allowances issued by the Secretary under this section shall be denominated in units of metric tons of carbon dioxide equivalent.

“(2) PERIOD OF USE.—An allowance issued by the Secretary under this section may be used during—

“(A) the calendar year for which the allowance is issued; or

“(B) any subsequent calendar year.

“(3) SERIAL NUMBERS.—The Secretary shall—

“(A) assign a unique serial number to each allowance issued under this subtitle; and

“(B) retire the serial number of an allowance on the date on which the allowance is submitted under section 1615.

## “SEC. 1614. ALLOCATION AND AUCTION OF GREENHOUSE GAS ALLOWANCES.

“(a) Allocation of Allowances.—

“(1) DEFINITION OF STATE.—In this subsection, the term ‘State’ means—

“(A) each of the several States of the United States;

“(B) the District of Columbia;

“(C) the Commonwealth of Puerto Rico;

“(D) Guam;

“(E) American Samoa;

“(F) the Commonwealth of the Northern Mariana Islands;

“(G) the Federated States of Micronesia;

“(H) the Republic of the Marshall Islands;

“(I) the Republic of Palau; and

“(J) the United States Virgin Islands.

“(2) ALLOCATIONS.—Not later than the date that is 2 years before the beginning of the initial allocation period, and each subsequent allocation period, the Secretary shall allocate for each calendar year during the allocation period a quantity of allowances in accordance with this subsection.

“(3) QUANTITY.—The total quantity of allowances available to be allocated to industry and States [OR: to industry and by the President] for each calendar year of an allocation period shall be the product obtained by multiplying—

“(A) the total quantity of allowances issued for the calendar year under subsection (a)(3) or (b)(3) of section 1613; and

“(B) the allocation percentage for the calendar year under subsection (c).

“(4) ALLOWANCE ALLOCATION RULEMAKING.—Not later than 18 months after the date of enactment of this subtitle, the Secretary shall establish, by rule, procedures for allocating allowances in accordance with the criteria established under this subsection, including requirements (including forms and schedules for submission) for the reporting of information necessary for the allocation of allowances under this section.

“(5) DISTRIBUTION OF ALLOWANCES TO INDUSTRY.—The allowances available for allocation to industry under paragraph (3) shall be distributed as follows:

“(A) COAL MINES.—

“(i) DEFINITION OF ELIGIBLE COAL MINE.—In this subparagraph, the term ‘eligible coal mine’ means a coal mine located in the United States that is a regulated fuel distributor.

“(ii) TOTAL ALLOCATION.—For each year, eligible coal mines shall be allocated  $\frac{7}{55}$  of the total quantity of allowances available for allocation to industry under paragraph (3).

“(iii) INDIVIDUAL ALLOCATIONS.—For any year, the quantity of allowances allocated to an eligible coal mine shall be the quantity equal to the product obtained by multiplying—

“(I) the total allocation to eligible coal mines under clause (ii); and

“(II) the ratio that—

“(aa) the carbon content of coal produced at the eligible coal mine during the 3-year period beginning on January 1, 2004; bears to

“(bb) the carbon content of coal produced at all eligible coal mines in the United States during that period.

“(B) PETROLEUM REFINERS.—

“(i) TOTAL ALLOCATION.—For each year, the petroleum refining sector shall be allocated  $\frac{4}{55}$  of the total quantity of allowances available for allocation to industry under paragraph (3).

“(ii) INDIVIDUAL ALLOCATIONS.—For any year, the quantity of allowances allocated to a petroleum refinery located in the United States shall be the quantity equal to the product obtained by multiplying—

“(I) the total allocation to the petroleum refining sector under clause (i); and

“(II) the ratio that—

“(aa) the carbon content of petroleum products produced at the refinery during the 3-year period beginning on January 1, 2004; bears to

“(bb) the carbon content of petroleum products produced at all refineries in the United States during that period.

“(C) NATURAL GAS PROCESSORS.—

“(i) DEFINITION OF ELIGIBLE NATURAL GAS PROCESSOR.—In this subparagraph, the term ‘eligible natural gas processor’ means a natural gas processor located in the United States that is a regulated fuel distributor.

“(ii) TOTAL ALLOCATION.—For each year, eligible natural gas processors shall be allocated  $\frac{2}{55}$  of the total quantity of allowances available for allocation to industry under paragraph (3).

“(iii) INDIVIDUAL ALLOCATIONS.—For any year, the quantity of allowances allocated to an eligible natural gas processor shall be the quantity equal to the product obtained by multiplying—

“(I) the total allocation to eligible natural gas processors under



clause (ii); and

“(II) the ratio that—

“(aa) the sum of, for the 3-year period beginning on January 1, 2004—

“(AA) the carbon content of natural gas liquids produced by the eligible natural gas processor; and

“(BB) the carbon content of the natural gas delivered into commerce by the eligible natural gas processor; bears to

“(bb) the sum of, for that period—

“(AA) the carbon content of natural gas liquids produced by all eligible natural gas processors; and

“(BB) the carbon content of the natural gas delivered into commerce by all eligible natural gas processors.

“(D) ELECTRICITY GENERATORS.—

“(i) DEFINITION OF ELIGIBLE ELECTRICITY GENERATOR.—In this subparagraph, the term ‘eligible electricity generator’ means an electricity generator located in the United States that is a fossil fuel-fired electricity generator.

“(ii) TOTAL ALLOCATION.—For each year, eligible electricity generators shall be allocated  $\frac{30}{55}$  of the total quantity of allowances available for allocation to industry under paragraph (3).

“(iii) INDIVIDUAL ALLOCATIONS.—For any year, the quantity of allowances allocated to an eligible electricity generator shall be the quantity equal to the product obtained by multiplying—

“(I) the total allocation to eligible electricity generators under clause (ii); and

“(II) the ratio that—

“(aa) the carbon content of the fossil fuel input of the eligible electricity generator during the 3-year period beginning on January 1, 2004; bears to

“(bb) the total carbon content of fossil fuel input of eligible electricity generators in the United States during that period.

“(E) CARBON-INTENSIVE MANUFACTURING SECTORS.—

“(i) DEFINITION OF ELIGIBLE MANUFACTURER.—In this subparagraph, the term ‘eligible manufacturer’ means a carbon-intensive manufacturer located in the United States that [used more than \_\_\_\_ during \_\_\_\_; need to define/specify; need to exclude fossil fuel-fired electricity generation].

“(ii) TOTAL ALLOCATION.—For each year, eligible manufacturers shall be allocated  $\frac{10}{55}$  of the total quantity of allowances available for

allocation to industry under paragraph (3).

“(iii) INDIVIDUAL ALLOCATIONS.—For any year, the quantity of allowances allocated to an eligible manufacturer shall be the quantity equal to the product obtained by multiplying—

“(I) the total allocation to eligible manufacturers under clause (ii); and

“(II) the ratio that—

“(aa) the carbon content of fossil fuel combusted at the eligible manufacturer during the 3-year period beginning on January 1, 2004; bears to

“(bb) the total carbon content of fossil fuel combusted at all eligible manufacturers in the United States during that period.

“(F) NONFUEL REGULATED ENTITIES.—

“(i) TOTAL ALLOCATION.—For each year, nonfuel regulated entities shall be allocated  $\frac{2}{55}$  of the total quantity of allowances available for allocation to industry under paragraph (3).

“(ii) INDIVIDUAL ALLOCATIONS.—For any year, the quantity of allowances allocated to a nonfuel regulated entity shall be the quantity equal to the product obtained by multiplying—

“(I) the total allocation to nonfuel regulated entities under clause (i); and

“(II) the ratio that—

“(aa) the carbon dioxide equivalent of the nonfuel-related greenhouse gas produced or emitted by the nonfuel regulated entity at facilities in the United States during the 3-year period beginning on January 1, 2004; bears to

“(bb) the carbon dioxide equivalent of the nonfuel-related greenhouse gases produced or emitted by all nonfuel regulated entities at facilities in the United States during that period.

“(6) ALLOWANCES TO STATES.—

“(A) DISTRIBUTION.—The allowances available for allocation to States under paragraph (3) shall be distributed as follows:

“(i) For each year,  $\frac{1}{2}$  of the quantity of allowances available for allocation to States under paragraph (3) shall be allocated among the States based on the ratio that—

“(I) the greenhouse gas emissions of the State during the 3-year period beginning on January 1, 2004; bears to

“(II) the greenhouse gas emissions of all States for that period.

“(ii) For each year,  $\frac{1}{2}$  of the quantity of allowances available for

allocation to States under paragraph (3) shall be allocated among the States based on the ratio that—

“(I) the population of the State, as determined by the 2000 decennial census; bears to

“(II) the population of all States as determined by that census.

“(B) USE.—

“(i) IN GENERAL.—During any year, a State shall use not less than 90 percent of the allowances allocated to the State for that year—

“(I) to mitigate impacts on low-income energy consumers;

“(II) to promote energy efficiency;

“(III) to promote investment in nonemitting electricity generation technology;

“(IV) to encourage advances in energy technology that reduce or sequester greenhouse gas emissions;

“(V) to avoid distortions in competitive electricity markets;

“(VI) to mitigate obstacles to investment by new entrants in electricity generation markets;

“(VII) to address local or regional impacts of climate change policy, including providing assistance to displaced workers;

“(VIII) to mitigate impacts on energy-intensive industries in internationally-competitive markets; or

“(IX) to enhance energy security.

“(ii) DEADLINE.—A State shall allocate allowances for use in accordance with clause (i) by not later than 1 year before the beginning of each allowance allocation period.

][“(6) [POSSIBLE SUBSTITUTE FOR (6)] distribution of allowances by president.—

][“(A) IN GENERAL.—The President shall distribute the allowances available for allocation by the President under paragraph (3) in a manner designed to mitigate the undue impacts of the program under this subtitle.]

][“(B) USE.—During any year, the President shall use not less than 90 percent of the allowances available for allocation by the President for that year—]

][“(i) to mitigate impacts on low-income energy consumers;]

][“(ii) to promote energy efficiency;]

][“(iii) to promote investment in nonemitting electricity generation technology;]

][“(iv) to support advances in energy technology that reduce or sequester

greenhouse gas emissions;]

[“(v) to avoid distortions in competitive electricity markets;]

[“(vi) to mitigate obstacles to investment by new entrants in electricity generation markets;]

[“(vii) to address local or regional impacts of climate change policy, including providing assistance to displaced workers;]

[“(viii) to mitigate impacts on energy-intensive industries in internationally-competitive markets; and]

[“(ix) to enhance energy security.]

[“(C) DEADLINE.—The President shall allocate allowances for use in accordance with subparagraph (B) by not later than 1 year before the beginning of each allowance allocation period. [Corresponding changes needed elsewhere if this paragraph is selected.]]

“(7) COST OF ALLOWANCES.—The Secretary shall distribute allowances under this subsection at no cost to the recipient of the allowance.

“(b) Auction of Allowances.—

“(1) IN GENERAL.—The Secretary shall establish, by rule, a procedure for the auction of a quantity of allowances during each calendar year in accordance with paragraph (2).

“(2) BASE QUANTITY.—The base quantity of allowances to be auctioned during a calendar year shall be the product obtained by multiplying—

“(A) the total number of allowances for the calendar year under subsection (a)(3) or (b)(3) of section 1613; and

“(B) the auction percentage for the calendar year under subsection (c).

“(3) SCHEDULE.—The auction of allowances shall be held on the following schedule:

“(A) In 2009, the Secretary shall auction—

“(i)  $\frac{1}{2}$  of the allowances available for auction for 2012; and

“(ii)  $\frac{1}{2}$  of the allowances available for auction for 2013.

“(B) In 2010, the Secretary shall auction  $\frac{1}{2}$  of the allowances available for auction for 2014.

“(C) In 2011, the Secretary shall auction  $\frac{1}{2}$  of the allowances available for auction for 2015.

“(D) In 2012 and each subsequent calendar year, the Secretary shall auction—

“(i)  $\frac{1}{2}$  of the allowances available for auction for that calendar year; and

“(ii) 1/2 of the allowances available for auction for the calendar year that is 4 years after that calendar year.

“(4) **UNDISTRIBUTED ALLOWANCES.**—In an auction held during any calendar year, the Secretary shall auction any allowance that was—

“(A) available for allocation by the Secretary under subsection (a) for the calendar year, but not distributed;

“(B) available during the preceding calendar year for an agricultural sequestration or early reduction activity under section 1620 or 1621, but not distributed during that calendar year; or

“(C) available for distribution by a State under subsection (a)(6), but not distributed by the date that is 1 year before the beginning of the applicable allocation period.

“(c) **Available Percentages.**—Except as directed under section 1622, the percentage of the total quantity of allowances for each calendar year to be available for allocation, agricultural sequestration and early reduction projects, and auction shall be determined in accordance with the following

table:6,L4(4,4,4,4,0),j,tp10,p10,10/12,g1,t1,s5,xl10,xl8R,xl8R,xl8R,xl10

1Year1Percentage Allocated to Industry	1Percentage Allocated to States	1Percentage Available for Agricultural Sequestration	1Percentage Available for Early Reduction Allowances	1Percentage Auctioned
--	---------------------------------	--	--	-----------------------

201255295110 s,s,s,s,s,s

201355295110 s,s,s,s,s,s

201455295110 s,s,s,s,s,s

201555295110 s,s,s,s,s,s

201655295110 s,s,s,s,s,s

201753295112 s,s,s,s,s,s

201851295114 s,s,s,s,s,s

201949295116 s,s,s,s,s,s

202047295118 s,s,s,s,s,s

202145295120 s,s,s,s,s,s

2022 and thereafter 2 less than allocated to industry in the prior year, but not less than 03050 2 more than available for auction in the prior year, but not more than 65

## “SEC. 1615. SUBMISSION OF ALLOWANCES.

“(a) **Requirements.**—

“(1) **REGULATED FUEL DISTRIBUTORS.**—For calendar year 2012 and each calendar year thereafter, each regulated fuel distributor shall submit to the Secretary a number of allowances equal to the carbon dioxide equivalent of the quantity of covered fuel,

determined in accordance with subsection (b)(1), for the regulated fuel distributor.

“(2) NONFUEL REGULATED ENTITIES.—For 2012 and each calendar year thereafter, each nonfuel regulated entity shall submit to the Secretary a number of allowances equal to the carbon dioxide equivalent of the quantity of nonfuel-related greenhouse gas, determined in accordance with subsection (b)(2), for the nonfuel regulated entity.

“(b) Regulated Quantities.—

“(1) COVERED FUELS.—For purposes of subsection (a)(1), the quantity of covered fuel shall be equal to—

“(A) for a petroleum refinery located in the United States, the quantity of petroleum products refined, produced, or consumed at the refinery;

“(B) for a natural gas processing plant located in the United States, a quantity equal to the sum of—

“(i) the quantity of natural gas liquids produced or consumed at the plant; and

“(ii) the quantity of natural gas delivered into commerce from, or consumed at, the plant;

“(C) for a coal mine located in the United States, the quantity of coal produced or consumed at the mine; and

“(D) for an importer of coal, petroleum products, or natural gas liquids into the United States, the quantity of coal, petroleum products, or natural gas liquids imported into the United States.

“(2) NONFUEL-RELATED GREENHOUSE GASES.—For purposes of subsection (a)(2), the quantity of nonfuel-related greenhouse gas shall be equal to—

“(A) for a manufacturer or importer of hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, or nitrous oxide, the quantity of hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, or nitrous oxide produced or imported by the manufacturer or importer;

“(B) for an underground coal mine, the quantity of methane emitted by the coal mine;

“(C) for a facility that manufactures adipic acid or nitric acid, the quantity of nitrous oxide emitted by the facility;

“(D) for an aluminum smelter, the quantity of perfluorocarbons emitted by the smelter; and

“(E) for a facility that produces hydrochlorofluorocarbon-22, the quantity of hydrofluorocarbon-23 emitted by the facility.

“(3) ADJUSTMENTS.—

“(A) REGULATED FUEL DISTRIBUTORS.—

“(i) Modification.—The Secretary may modify, by rule, a quantity of

covered fuels under paragraph (1) if the Secretary determines that the modification is necessary to ensure that—

“(I) allowances are submitted for all units of covered fuel; and

“(II) allowances are not submitted for the same quantity of covered fuel by more than 1 regulated fuel distributor.

“(ii) EXTENSION.—The Secretary may extend, by rule, the requirement to submit allowances under subsection (a)(1) to an entity that is not a regulated fuel distributor if the Secretary determines that the extension is necessary to ensure that allowances are submitted for all covered fuels.

“(B) NONFUEL REGULATED ENTITIES.—The Secretary may modify, by rule, a quantity of nonfuel-related greenhouse gases under paragraph (2) if the Secretary determines the modification is necessary to ensure that allowances are not submitted for the same volume of nonfuel-related greenhouse gas by more than 1 regulated entity.

“(c) Deadline for Submission.—Any entity required to submit an allowance to the Secretary under this section shall submit the allowance not later than March 31 of the calendar year following the calendar year for which the allowance is required to be submitted.

“(d) Regulations.—The Secretary shall promulgate such regulations as the Secretary determines to be necessary or appropriate to—

“(1) identify and register each regulated entity that is required to submit an allowance under this section; and

“(2) require the submission of reports and otherwise obtain any information the Secretary determines to be necessary to calculate or verify the compliance of a regulated entity with any requirement under this section.

“(e) Exemption Authority for Non-Fuel Regulated Entities.—

“(1) IN GENERAL.—Except as provided in paragraph (2), the Secretary may exempt from the requirements of this subtitle an entity that emits, manufactures, or imports nonfuel-related greenhouse gases for any period during which the Secretary determines, after providing an opportunity for public comment, that measuring or estimating the quantity of greenhouse gases emitted, manufactured, or imported by the entity is not feasible.

“(2) EXCLUSION.—The Secretary may not exempt a regulated fuel distributor from the requirements of this subtitle under paragraph (1).

“(f) Retirement of Allowances.—

“(1) IN GENERAL.—Any person or entity that is not subject to this subtitle may submit to the Secretary an allowance for retirement at any time.

“(2) ACTION BY SECRETARY.—On receipt of an allowance under paragraph (1), the Secretary—

“(A) shall accept the allowance; and

“(B) shall not allocate, auction, or otherwise reissue the allowance.

“(g) Submission of Credits.—A regulated entity may submit a credit distributed by the Secretary pursuant to section 1618, 1619, or 1622(e) in lieu of an allowance.

“(h) Clean Development Mechanism Certified Emission Reductions.—

“(1) IN GENERAL.—The Secretary shall establish, by regulation, procedures under which a regulated entity may submit a clean development mechanism certified emission reduction in lieu of an allowance under this section.

“(2) CLEAR TITLE AND PREVENTION OF DOUBLE-COUNTING.—Procedures established by the Secretary under this subsection shall include such provisions as the Secretary considers to be appropriate to ensure that—

“(A) a regulated entity that submits a clean development mechanism certified emission reduction in lieu of an allowance has clear title to that certified emission reduction; and

“(B) a clean development mechanism certified emission reduction submitted in lieu of an allowance has not been and cannot be used in the future for compliance purposes under any foreign greenhouse gas regulatory program.

“(i) Study on Process Emissions.—

“(1) IN GENERAL.—Not later than [\_\_\_\_\_], the Secretary shall—

“(A) carry out a study of the feasibility of requiring the submission of allowances for process emissions not otherwise covered by this subtitle; and

“(B) submit to Congress a report that describes the results of the study (including recommendations of the Secretary based on those results).

## “SEC. 1616. SAFETY VALVE.

“The Secretary shall accept from a regulated entity a payment of the applicable safety valve price for a calendar year in lieu of submission of an allowance under section 1615 for that calendar year.

## “SEC. 1617. ALLOWANCE TRADING SYSTEM.

“(a) In General.—The Secretary shall—

“(1) establish, by rule, a trading system under which allowances and credits may be sold, exchanged, purchased, or transferred by any person or entity, including a registry for issuing, recording, and tracking allowances and credits; and

“(2) specify all procedures and requirements required for orderly functioning of the trading system.

“(b) Transparency.—

“(1) IN GENERAL.—The trading system under subsection (a) shall include such provisions as the Secretary considers to be appropriate to—

“(A) facilitate price transparency and participation in the market for



allowances and credits; and

“(B) protect buyers and sellers of allowances and credits, and the public, from the adverse effects of collusion and other anticompetitive behaviors.

“(2) AUTHORITY TO OBTAIN INFORMATION.—The Secretary may obtain any information the Secretary considers to be necessary to carry out this section from any person or entity that buys, sells, exchanges, or otherwise transfers an allowance or credit.

“(c) Banking.—Any allowance or credit may be submitted for compliance during any year following the year for which the allowance or credit was issued.

## “SEC. 1618. CREDITS FOR FEEDSTOCKS AND EXPORTS.

“(a) In General.—The Secretary shall establish, by rule, a program under which the Secretary distributes credits to entities in accordance with this section.

“(b) Use of Fuels as Feedstocks.—If the Secretary determines that an entity has used a covered fuel as a feedstock so that the carbon dioxide associated with the covered fuel will not be emitted, the Secretary shall distribute to that entity, for 2012 and each subsequent calendar year, a quantity of credits equal to the quantity of covered fuel used as feedstock by the entity during that year, measured in carbon dioxide equivalents.

“(c) Exporters of Covered Fuel.—If the Secretary determines that an entity has exported covered fuel, the Secretary shall distribute to that entity, for 2012 and each subsequent calendar year, a quantity of credits equal to the quantity of covered fuel exported by the entity during that year, measured in carbon dioxide equivalents.

“(d) Other Exporters.—If the Secretary determines that an entity has exported hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, or nitrous oxide, the Secretary shall distribute to that entity, for 2012 and each subsequent calendar year, a quantity of credits equal to the volume of hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, or nitrous oxide exported by the entity during that year, measured in carbon dioxide equivalents.

## “SEC. 1619. CREDITS FOR OFFSET PROJECTS.

“(a) Establishment.—The Secretary shall establish, by regulation, a program under which the Secretary shall distribute credits to entities that carry out offset projects in the United States that—

“(1)(A) reduce any greenhouse gas emissions that are not covered greenhouse gas emissions; or

“(B) sequester a greenhouse gas;

“(2) meet the requirements of section 1623(c); and

“(3) are consistent with maintaining the environmental integrity of the program under this subtitle.

“(b) Categories of Offset Projects Eligible for Streamlined Procedures.—

“(1) IN GENERAL.—The program established under this section shall include the use of streamlined procedures for distributing credits to categories of projects for which the Secretary determines there are broadly-accepted standards or methodologies for quantifying and verifying the greenhouse gas emission mitigation benefits of the projects.

“(2) CATEGORIES OF PROJECTS.—The streamlined procedures described in paragraph (1) shall apply to—

“(A) geologic sequestration projects not involving enhanced oil recovery;

“(B) landfill methane use projects;

“(C) animal waste or municipal wastewater methane use projects;

“(D) projects to reduce sulfur hexafluoride emissions from transformers;

“(E) projects to destroy hydrofluorocarbons; and

“(F) such other categories of projects as the Secretary may specify by regulation.

“(c) Other Projects.—With respect to an offset project that is eligible to be carried out under this section but that is not classified within any project category described in subsection (b), the Secretary may distribute credits on a basis of less than 1-credit-for-1-ton.

“(d) Ineligible Offset Projects.—An offset project shall not be eligible to receive a credit under this section if the offset project is eligible to receive credits or allowances under section 1618, 1620, 1621, or 1622(e).

## “SEC. 1620. EARLY REDUCTION ALLOWANCES.

“(a) Establishment.—The Secretary shall establish, by rule, a program under which the Secretary distributes to any entity that carries out a project to reduce or sequester greenhouse gas emissions before the initial allocation period a quantity of allowances that reflects the actual emissions reductions or net sequestration of the project, as determined by the Secretary.

“(b) Available Allowances.—The total quantity of allowances distributed under subsection (a) may not exceed the product obtained by multiplying—

“(1) the total number of allowances issued for the calendar year under subsection (a)(3) of section 1613; and

“(2) the percentage available for early reduction allowances for the calendar year under section 1614(c).

“(c) Eligibility.—The Secretary may distribute allowances for early reduction projects only to an entity that has reported the reduced or sequestered greenhouse gas emissions under—

“(1) the Voluntary Reporting of Greenhouse Gases Program of the Energy Information Administration under section 1605(b) of the Energy Policy Act of 1992

(42 U.S.C. 13385(b));

“(2) the Climate Leaders Program of the Environmental Protection Agency; or

“(3) a State-administered or privately-administered registry that includes early reduction actions not covered under the programs described in paragraphs (1) and (2).

## “SEC. 1621. AGRICULTURAL SEQUESTRATION PROJECTS.

“(a) Establishment.—The Secretary of Agriculture shall establish, by rule, a program under which agricultural sequestration allowances are distributed to entities that carry out soil carbon sequestration projects [and other projects?] that—

“(1) meet the requirements of section 1623(c); and

“(2) achieve sequestration results that are—

“(A) greater than sequestration results achieved pursuant to standard agricultural practices; and

[“(B) long-term.]

“(b) Quantity.—During a calendar year, the Secretary of Agriculture shall distribute agricultural sequestration allowances in a quantity not greater than the product obtained by multiplying—

“(1) the total number of allowances issued for the calendar year under section 1613; and

“(2) the percentage of allowances available for agricultural sequestration under section 1614(c).

“(c) Oversubscription.—If, during a calendar year, the qualifying agricultural sequestration exceeds the quantity of agricultural sequestration allowances available for distribution under subsection (b), the Secretary of Agriculture may distribute allowances on a basis of less than 1-allowance-for-1-ton.

## “SEC. 1622. CONGRESSIONAL REVIEW.

“(a) Interagency Review.—

“(1) IN GENERAL.—Not later than January 15, 2016, and every 5 years thereafter, the President shall establish an interagency group to review and make recommendations relating to—

“(A) each program under this subtitle; and

“(B) any similar program of a foreign country described in paragraph (2).

“(2) COUNTRIES TO BE REVIEWED.—An interagency group established under paragraph (1) shall review actions and programs relating to greenhouse gas emissions of—

“(A) each member country (other than the United States) of the Organisation

for Economic Co-operation and Development;

“(B) China;

“(C) India;

“(D) Brazil;

“(E) Mexico;

“(F) Russia; and

“(G) Ukraine.

“(3) INCLUSIONS.—A review under paragraph (1) shall—

“(A) for the countries described in paragraph (2), analyze whether the countries that are the highest emitting countries and, collectively, contribute at least 75 percent of the total greenhouse gas emissions of those countries have taken action that—

“(i) in the case of member countries of the Organisation for Economic Co-Operation and Development, is comparable to that of the United States; and

“(ii) in the case of China, India, Brazil, Mexico, Russia, and Ukraine, is significant, contemporaneous, and equitable compared to action taken by the United States;

“(B) analyze whether each of the 5 largest trading partners of the United States, as of the date on which the review is conducted, has taken action with respect to greenhouse gas emissions that is comparable to action taken by the United States;

“(C) analyze whether the programs established under this subtitle have contributed to an increase in electricity imports from Canada or Mexico; and

“(D) make recommendations with respect to whether—

“(i) the rate of reduction of emissions intensity under subsection (a)(2) or (b)(2) of section 1613 should be modified; and

“(ii) the rate of increase of the safety valve price should be modified.

“(4) SUPPLEMENTARY REVIEW ELEMENTS.—A review under paragraph (1) may include an analysis of—

“(A) the feasibility of regulating owners or operators of entities that—

“(i) emit nonfuel-related greenhouse gases; and

“(ii) that are not subject to this subtitle;

“(B) whether the percentage of allowances for any calendar year that are auctioned under section 1614(c) should be modified;

“(C) whether regulated entities should be allowed to submit credits issued under foreign greenhouse gas regulatory programs in lieu of allowances under

section 1615;

“(D) whether the Secretary should distribute credits for offset projects carried out outside the United States that do not receive credit under a foreign greenhouse gas program; and

“(E) whether and how the value of allowances or credits banked for use during a future year should be discounted if an acceleration in the rate of increase of the safety valve price is recommended under paragraph (3)(D)(ii).

“(5) NATIONAL RESEARCH COUNCIL REPORTS.—The President may request such reports from the National Research Council as the President determines to be necessary and appropriate to support the interagency review process under this subsection.

“(b) Report.—

“(1) IN GENERAL.—Not later than January 15, 2017, and every 5 years thereafter, the President shall submit to the House of Representatives and the Senate a report describing any recommendation of the President with respect to changes in the programs under this subtitle.

“(2) RECOMMENDATIONS.—A recommendation under paragraph (1) shall take into consideration the results of the most recent interagency review under subsection (a).

“(c) Congressional Action.—

“(1) CONSIDERATION.—Not later than September 30 of any calendar year during which a report is to be submitted under subsection (b), the House of Representatives and the Senate may consider a joint resolution, in accordance with paragraph (2), that—

“(A) amends subsection (a)(2) or (b)(2) of section 1613;

“(B) modifies the safety valve price; or

“(C) modifies the percentage of allowances to be allocated under section 1614(c).

“(2) REQUIREMENTS.—A joint resolution considered under paragraph (1) shall—

“(A) be introduced during the 45-day period beginning on the date on which a report is required to be submitted under subsection (b); and

“(B) after the resolving clause and ‘That’, contain only 1 or more of the following:

“(i) ‘, effective beginning January 1, 2017, section 1613(a)(2) of the Energy Policy Act of 1992 is amended by striking “2.6” and inserting “\_\_\_\_\_”.’.

“(ii) ‘, effective beginning \_\_\_\_\_, section 1613(b)(2) of the Energy Policy Act of 1992 is amended by striking “3.0” and inserting “\_\_\_\_\_”.’.

“(iii) ‘, effective beginning \_\_\_\_\_, section 1612(13)(B) of the Energy

Policy Act of 1992 is amended by striking “5 percent” and inserting “\_\_\_ percent”.’.

“(iv) ‘the table under section 1614(c) of the Energy Policy Act of 1992 is amended by striking the line relating to calendar year 2022 and thereafter and inserting the following:6,L4(4,4,4,4,0),tp0,p10,10/12,g1,t1,s60,8,8,8,8,8

1Year1Percentage Allocated to Industry1Percentage Allocated to States1Percentage Available for Agricultural Sequestration1Percentage Available for Early Reduction Allowances1Percentage Auctioned

2022 and thereafter\_\_\_\_\_

“(3) APPLICABLE LAW.—Subsections (b) through (g) of section 802 of title 5, United States Code, shall apply to any joint resolution under this subsection.

“(d) Foreign Credits.—

“(1) REGULATIONS.—After taking into consideration the initial interagency review under section (a), the Secretary may promulgate regulations that authorize regulated entities to submit credits issued under foreign greenhouse gas regulatory programs in lieu of allowances under section 1615.

“(2) COMPARABLE PROGRAMS AND PREVENTION OF DOUBLE-COUNTING.—Regulations promulgated by the Secretary under paragraph (1) shall ensure that foreign credits submitted in lieu of allowances are—

“(A) from foreign greenhouse gas regulatory programs that the Secretary determines to have a level of environmental integrity that is not less than the level of environmental integrity of the programs under this subtitle; and

“(B) not also submitted for use in achieving compliance under any foreign greenhouse gas regulatory program.

“(e) International Offsets Projects.—

“(1) ACTION BY THE SECRETARY.—After taking into consideration the results of the initial interagency review under section (a), the Secretary may promulgate regulations establishing a program under which the Secretary distributes credits to entities that—

“(A) carry out offset projects outside the United States that meet the requirements of section 1623(c);

“(B) maintain the environment integrity of the program under this subtitle; and

“(C) do not receive credits issued under a foreign greenhouse gas regulatory program.

“(2) STREAMLINED PROCEDURES AND PREVENTION OF DOUBLE-COUNTING.—Regulations promulgated by the Secretary under the paragraph (1) shall—

“(A) have streamlined procedures for distributing credits to projects for which the Secretary determines there are broadly-accepted standards or

methodologies for quantifying and verifying the greenhouse gas emission mitigation benefits of the projects; and

“(B) ensure that offset project reductions credited under the program are not also credited under foreign programs.

## “SEC. 1623. MONITORING AND REPORTING.

“(a) In General.—The Secretary shall require, by rule, that a regulated entity shall perform such monitoring and submit such reports as the Secretary determines to be necessary to carry out this subtitle.

“(b) Submission of Information.—The Secretary shall establish, by rule, any procedure the Secretary determines to be necessary to ensure the completeness, consistency, transparency, and accuracy of reports under subsection (a), including—

“(1) accounting and reporting standards for covered greenhouse gas emissions;

“(2) standardized methods of calculating covered greenhouse gas emissions in specific industries from other information the Secretary determines to be available and reliable, such as energy consumption data, materials consumption data, production data, or other relevant activity data;

“(3) if the Secretary determines that a method described in paragraph (2) is not feasible for a regulated entity, a standardized method of estimating covered greenhouse gas emissions of the regulated entity;

“(4) a method of avoiding double counting of covered greenhouse gas emissions;

“(5) a procedure to prevent a regulated entity from avoiding the requirements of this subtitle by—

“(A) reorganization into multiple entities; or

“(B) outsourcing the operations or activities of the regulated entity with respect to covered greenhouse gas emissions; and

“(6) a procedure for the verification of data relating to covered greenhouse gas emissions by—

“(A) regulated entities; and

“(B) independent verification organizations.

“(c) Determining Eligibility for Credits, Agricultural Sequestration Allowances, and Early Reduction Allowances.—

“(1) IN GENERAL.—An entity shall provide the Secretary with the information described in paragraph (2) in connection with any application to receive—

“(A) a credit under section 1618, 1619, or 1622(e);

“(B) an early reduction allowance under section 1620 (unless, and to the extent that, the Secretary determines that providing the information would not be feasible for the entity); or

“(C) an agricultural sequestration allowance under section 1621.

“(2) REQUIRED INFORMATION.—

“(A) GREENHOUSE GAS EMISSIONS REDUCTION.—In the case of a greenhouse gas emissions reduction, the entity shall provide the Secretary with information verifying that, as determined by the Secretary—

“(i) the entity has achieved an actual reduction in greenhouse gas emissions—

“(I) relative to historic emissions levels of the entity; and

“(II) taking into consideration any increase in other greenhouse gas emissions of the entity; and

“(ii) if the reduction exceeds the net reduction of direct greenhouse gas emissions of the entity, the entity reported a reduction that was adjusted so as not to exceed the net reduction.

“(B) GREENHOUSE GAS SEQUESTRATION.—In the case of a greenhouse gas sequestration, the entity shall provide the Secretary with information verifying that, as determined by the Secretary, the entity has achieved actual increases in net sequestration, taking into account the total use of materials and energy by the entity in carrying out the sequestration.

## “SEC. 1624. ENFORCEMENT.

“(a) Failure to Submit Allowances.—

“(1) PAYMENT TO SECRETARY.—A regulated entity that fails to submit an allowance (or the safety valve price in lieu of an allowance) for a calendar year not later than March 31 of the following calendar year shall pay to the Secretary, for each allowance the regulated entity failed to submit, an amount equal to the product obtained by multiplying—

“(A) the safety valve price for that calendar year; and

“(B) 3.

“(2) FAILURE TO PAY.—A regulated entity that fails to make a payment to the Secretary under paragraph (1) by December 31 of the calendar year following the calendar year for which the payment is due shall be subject to subsection (b) or (c), or both.

“(b) Civil Enforcement.—

“(1) PENALTY.—A person that the Secretary determines to be in violation of this subtitle shall be subject to a civil penalty of not more than \$25,000 for each day during which the entity is in violation, in addition to any amount required under subsection (a)(1).

“(2) INJUNCTION.—The Secretary may bring a civil action for a temporary or permanent injunction against any person described in paragraph (1).

“(c) Criminal Penalties.—A person that willfully fails to comply with this subtitle shall be subject to a fine under title 18, United States Code, or imprisonment for not to exceed



5 years, or both.

## “SEC. 1625. JUDICIAL REVIEW.

“(a) In General.—Except as provided in subsection (b), section 336(b) of the Energy Policy and Conservation Act (42 U.S.C. 6306(b)) shall apply to a review of any rule issued under this subtitle in the same manner, and to the same extent, that section applies to a rule issued under sections 323, 324, and 325 of that Act (42 U.S.C. 6293, 6294, 6295).

“(b) Exception.—A petition for review of a rule under this subtitle shall be filed in the United States Court of Appeals for the District of Columbia.

## “SEC. 1626. ADMINISTRATIVE PROVISIONS.

“(a) Rules and Orders.—The Secretary may issue such rules and orders as the Secretary determines to be necessary or appropriate to carry out this subtitle.

“(b) Data.—

“(1) IN GENERAL.—In carrying out this subtitle, the Secretary may use any authority provided under section 11 of the Energy Supply and Environmental Coordination Act of 1974 (15 U.S.C. 796).

“(2) DEFINITION OF ENERGY INFORMATION.—For the purposes of carrying out this subtitle, the definition of the term ‘energy information’ under section 11 of the Energy Supply and Environmental Coordination Act of 1974 (15 U.S.C. 796) shall be considered to include any information the Secretary determines to be necessary or appropriate to carry out this subtitle.

## “SEC. 1627. EARLY TECHNOLOGY DEPLOYMENT.

“(a) Trust Fund.—

“(1) ESTABLISHMENT.—There is established in the Treasury a trust fund, to be known as the ‘Climate Change Trust Fund’ (referred to in this section as the ‘Trust Fund’).

“(2) DEPOSITS.—The Secretary shall deposit into the Trust Fund any funds received by the Secretary under section 1614(b) or 1616.

“(3) MAXIMUM CUMULATIVE AMOUNT.—Not more than \$50,000,000,000 may be deposited into the Trust Fund.

“(b) Distribution.—Beginning in fiscal year 2010, the Secretary shall transfer any funds deposited into the Trust Fund during the previous fiscal year as follows:

“(1) ZERO- OR LOW-CARBON ENERGY TECHNOLOGIES.—50 percent of the funds shall be transferred to the Secretary to carry out the zero- or low-carbon energy technologies program under subsection (c).

“(2) ADVANCED ENERGY TECHNOLOGIES INCENTIVE PROGRAM.—35 percent of the funds shall be transferred as follows:

“(A) ADVANCED COAL TECHNOLOGIES.—28 percent shall be transferred to

the Secretary to carry out the advanced coal and sequestration technologies program under subsection (d).

“(B) CELLULOSIC BIOMASS.—7 percent shall be transferred to the Secretary to carry out—

“(i) the cellulosic biomass ethanol and municipal solid waste loan guarantee program under section 212(b) of the Clean Air Act (42 U.S.C. 7546(b));

“(ii) the cellulosic biomass ethanol conversion assistance program under section 212(e) of that Act (42 U.S.C. 7546(e)); and

“(iii) the fuel from cellulosic biomass program under subsection (e).

“(3) ADVANCED TECHNOLOGY VEHICLES.—15 percent shall be transferred to the Secretary to carry out the advanced technology vehicles manufacturing incentive program under subsection (f).

“(c) Zero- or Low-Carbon Energy Technologies Deployment.—

“(1) DEFINITIONS.—In this subsection:

“(A) ENERGY SAVINGS.—The term ‘energy savings’ means megawatt-hours of electricity or million British thermal units of natural gas saved by a product, in comparison to projected energy consumption under the energy efficiency standard applicable to the product.

“(B) HIGH-EFFICIENCY CONSUMER PRODUCT.—The term ‘high-efficiency consumer product’ means a covered product to which an energy conservation standard applies under section 325 of the Energy Policy and Conservation Act (42 U.S.C. 6295), if the energy efficiency of the product exceeds the energy efficiency required under the standard.

“(C) ZERO- OR LOW-CARBON GENERATION.—The term ‘zero- or low-carbon generation’ means generation of electricity by an electric generation unit that—

“(i) emits no carbon dioxide into the atmosphere, or is fossil-fuel fired and emits into the atmosphere not more than 250 pounds of carbon dioxide per megawatt-hour (after adjustment for any carbon dioxide from the unit that is geologically sequestered); and

“(ii) was placed into commercial service after the date of enactment of this Act.

“(2) FINANCIAL INCENTIVES PROGRAM.—During each fiscal year beginning on or after October 1, 2008, the Secretary shall competitively award financial incentives under this subsection in the following technology categories:

“(A) Production of electricity from new zero- or low-carbon generation.

“(B) Manufacture of high-efficiency consumer products.

“(3) REQUIREMENTS.—

“(A) IN GENERAL.—The Secretary shall make awards under this subsection

to producers of new zero- or low-carbon generation and to manufacturers of high-efficiency consumer products—

“(i) in the case of producers of new zero- or low-carbon generation, based on the bid of each producer in terms of dollars per megawatt-hour of electricity generated; and

“(ii) in the case of manufacturers of high-efficiency consumer products, based on the bid of each manufacturer in terms of dollars per megawatt-hour or million British thermal units saved.

“(B) ACCEPTANCE OF BIDS.—

“(i) IN GENERAL.—In making awards under this subsection, the Secretary shall—

“(I) solicit bids for reverse auction from appropriate producers and manufacturers, as determined by the Secretary; and

“(II) award financial incentives to the producers and manufacturers that submit the lowest bids that meet the requirements established by the Secretary.

“(ii) FACTORS FOR CONVERSION.—

“(I) IN GENERAL.—For the purpose of assessing bids under clause (i), the Secretary shall specify a factor for converting megawatt-hours of electricity and million British thermal units of natural gas to common units.

“(II) REQUIREMENT.—The conversion factor shall be based on the relative greenhouse gas emission benefits of electricity and natural gas conservation.

“(C) INELIGIBLE UNITS.—A new unit for the generation of electricity that uses renewable energy resources shall not be eligible to receive an award under this subsection if the unit receives renewable energy credits under a Federal renewable portfolio standard.

“(4) FORMS OF AWARDS.—

“(A) ZERO- AND LOW-CARBON GENERATORS.—An award for zero- or low-carbon generation under this subsection shall be in the form of a contract to provide a production payment for each year during the first 10 years of commercial service of the generation unit in an amount equal to the product obtained by multiplying—

“(i) the amount bid by the producer of the zero- or low-carbon generation; and

“(ii) the megawatt-hours estimated to be generated by the zero- or low-carbon generation unit each year.

“(B) HIGH-EFFICIENCY CONSUMER PRODUCTS.—An award for a high-efficiency consumer product under this subsection shall be in the form of a

lump sum payment in an amount equal to the product obtained by multiplying—

“(i) the amount bid by the manufacturer of the high-efficiency consumer product; and

“(ii) the energy savings during the projected useful life of the high-efficiency consumer product, not to exceed 10 years, as determined under rules issued by the Secretary.

“(d) Advanced Coal and Sequestration Technologies Program.—

“(1) ADVANCED COAL TECHNOLOGIES.—

“(A) DEFINITION OF ADVANCED COAL GENERATION TECHNOLOGY.—In this paragraph, the term ‘advanced coal generation technology’ means integrated gasification combined cycle or other advanced coal-fueled power plant technologies that—

“(i) have a minimum of 50 percent coal heat input on an annual basis;

“(ii) provide a technical pathway for carbon capture and storage; and

“(iii) provide a technical pathway for co-production of a hydrogen slip-stream.

“(B) DEPLOYMENT INCENTIVES.—

“(i) IN GENERAL.—The Secretary shall use  $\frac{1}{2}$  of the funds provided to carry out this subsection during each fiscal year to provide Federal financial incentives to facilitate the deployment of not more than 20 gigawatts of advanced coal generation technologies.

“(ii) ADMINISTRATION.—In providing incentives under clause (i), the Secretary shall—

“(I) provide appropriate incentives for regulated investor-owned utilities, municipal utilities, electric cooperatives, and independent power producers, as determined by the Secretary; and

“(II) ensure that a range of the domestic coal types is employed in the facilities that receive incentives under this subparagraph.

“(C) FUNDING PRIORITIES.—

“(i) PROJECTS USING CERTAIN COALS.—In providing incentives under this paragraph, the Secretary shall set aside not less than 25 percent of any funds made available to carry out this paragraph for projects using lower rank coals, such as subbituminous coal and lignite.

“(ii) SEQUESTRATION ACTIVITIES.—After the Secretary has made awards for 2000 megawatts of capacity under this paragraph, the Secretary shall give priority to projects that will capture and sequester emissions of carbon dioxide, as determined by the Secretary.

“(D) DISTRIBUTION OF FUNDS.—A project that receives an award under this

paragraph may elect 1 of the following Federal financial incentives:

“(i) A loan guarantee under section 1403(b).

“(ii) A cost-sharing grant for not more than 50 percent of the cost of the project.

“(iii) Production payments of not more than 1.5 cents per kilowatt-hour of electric output during the first 10 years of commercial service of the project.

“(E) LIMITATION.—A project may not receive an award under this subsection if the project receives an award under subsection (c).

“(2) SEQUESTRATION.—

“(A) IN GENERAL.—The Secretary shall use  $\frac{1}{2}$  of the funds provided to carry out this subsection during each fiscal year for large-scale geologic carbon storage demonstration projects that use carbon dioxide captured from facilities for the generation of electricity using coal gasification or other advanced coal combustion processes, including facilities that receive assistance under paragraph (1).

“(B) PROJECT CAPITAL AND OPERATING COSTS.—The Secretary shall provide assistance under this paragraph to reimburse the project owner for a percentage of the incremental project capital and operating costs of the project that are attributable to carbon capture and sequestration, as the Secretary determines to be appropriate.

“(e) Fuel From Cellulosic Biomass.—

“(1) IN GENERAL.—The Secretary shall provide deployment incentives under this subsection to encourage a variety of projects to produce transportation fuels from cellulosic biomass, relying on different feedstocks in different regions of the United States.

“(2) PROJECT ELIGIBILITY.—Incentives under this paragraph shall be provided on a competitive basis to projects that produce fuels that—

“(A) meet United States fuel and emissions specifications;

“(B) help diversify domestic transportation energy supplies; and

“(C) improve or maintain air, water, soil, and habitat quality.

“(3) INCENTIVES.—Incentives under this subsection may consist of—

“(A) additional loan guarantees under section 1403(b) for the construction of production facilities and supporting infrastructure; or

“(B) production payments through a reverse auction in accordance with paragraph (4).

“(4) REVERSE AUCTION.—

“(A) IN GENERAL.—In providing incentives under this subsection, the Secretary shall—

“(i) prescribe rules under which producers of fuel from cellulosic biomass may bid for production payments under paragraph (3)(B); and

“(ii) solicit bids from producers of different classes of transportation fuel, as the Secretary determines to be appropriate.

“(B) REQUIREMENT.—The rules under subparagraph (A) shall require that incentives shall be provided to the producers that submit the lowest bid (in terms of cents per gallon) for each class of transportation fuel from which the Secretary solicits a bid.

“(f) Advanced Technology Vehicles Manufacturing Incentive Program.—

“(1) DEFINITIONS.—In this subsection:

“(A) ADVANCED LEAN BURN TECHNOLOGY MOTOR VEHICLE.—The term ‘advanced lean burn technology motor vehicle’ means a passenger automobile or a light truck with an internal combustion engine that—

“(i) is designed to operate primarily using more air than is necessary for complete combustion of the fuel;

“(ii) incorporates direct injection; and

“(iii) achieves at least 125 percent of the 2002 model year city fuel economy of vehicles in the same size class as the vehicle.

“(B) ADVANCED TECHNOLOGY VEHICLE.—The term ‘advanced technology vehicle’ means a light duty motor vehicle that—

“(i) is a hybrid motor vehicle or an advanced lean burn technology motor vehicle; and

“(ii) meets the following performance criteria:

“(I) Except as provided in paragraph (3)(A)(ii), the Tier II Bin 5 emission standard established in regulations prescribed by the Administrator of the Environmental Protection Agency under section 202(i) of the Clean Air Act (42 U.S.C. 7521(i)), or a lower numbered bin.

“(II) At least 125 percent of the base year city fuel economy for the weight class of the vehicle.

“(C) ENGINEERING INTEGRATION COSTS.—The term ‘engineering integration costs’ includes the cost of engineering tasks relating to—

“(i) incorporating qualifying components into the design of advanced technology vehicles; and

“(ii) designing new tooling and equipment for production facilities that produce qualifying components or advanced technology vehicles.

“(D) HYBRID MOTOR VEHICLE.—The term ‘hybrid motor vehicle’ means a motor vehicle that draws propulsion energy from onboard sources of stored energy that are—

- “(i) an internal combustion or heat engine using combustible fuel; and
- “(ii) a rechargeable energy storage system.

“(E) QUALIFYING COMPONENTS.—The term ‘qualifying components’ means components that the Secretary determines to be—

- “(i) specially designed for advanced technology vehicles; and
- “(ii) installed for the purpose of meeting the performance requirements of advanced technology vehicles.

“(2) MANUFACTURER FACILITY CONVERSION AWARDS.—The Secretary shall provide facility conversion funding awards under this subsection to automobile manufacturers and component suppliers to pay 30 percent of the cost of—

“(A) re-equipping or expanding an existing manufacturing facility to produce—

- “(i) qualifying advanced technology vehicles; or
- “(ii) qualifying components; and

“(B) engineering integration of qualifying vehicles and qualifying components.

“(3) PERIOD OF AVAILABILITY.—

“(A) PHASE I.—

“(i) IN GENERAL.—An award under paragraph (2) shall apply to—

“(I) facilities and equipment placed in service before January 1, 2016; and

“(II) engineering integration costs incurred during the period beginning on the date of enactment of this Act and ending on December 31, 2015.

“(ii) TRANSITION STANDARD FOR LIGHT DUTY DIESEL-POWERED VEHICLES.—For purposes of making an award under clause (i), the term ‘advanced technology vehicle’ includes a diesel-powered or diesel-hybrid light duty vehicle that—

“(I) has a weight greater than 6,000 pounds; and

“(II) meets the Tier II Bin 8 emission standard established in regulations prescribed by the Administrator of the Environmental Protection Agency under section 202(i) of the Clean Air Act (42 U.S.C. 7521(i)), or a lower numbered bin.

“(B) PHASE II.—If the Secretary determines under paragraph (4) that the program under this subsection has resulted in a substantial improvement in the ability of automobile manufacturers to produce light duty vehicles with improved fuel economy, the Secretary shall continue to make awards under paragraph (2) that shall apply to—

“(i) facilities and equipment placed in service before January 1, 2021;  
and

“(ii) engineering integration costs incurred during the period beginning  
on January 1, 2016, and ending on December 31, 2020.

“(4) DETERMINATION OF IMPROVEMENT.—

“(A) IN GENERAL.—Not later than January 1, 2015, the Secretary shall  
determine, after providing notice and an opportunity for public comment,  
whether the program under this subsection has resulted in a substantial  
improvement in the ability of automobile manufacturers to produce light duty  
vehicles with improved fuel economy.

“(B) EFFECT ON MANUFACTURERS.—In preparing the determination under  
subparagraph (A), the Secretary shall enter into an agreement with the National  
Academy of Sciences to analyze the effect of the program under this subsection  
on automobile manufacturers.

## “SEC. 1628. EFFECT OF SUBTITLE.

“Nothing in this subtitle affects the authority of Congress to limit, terminate, or change  
the value of an allowance or credit issued under this subtitle.”.



## **Appendix C. Provided Bill Summary**

## Market-Based GHG Emission Trading Discussion Draft

The 2005 Sense of the Senate resolution on climate change emphasized that the risks associated with a changing climate justify the adoption of mandatory limits on greenhouse gas (GHG) emissions and that an important first step towards addressing climate change can be taken at an acceptable cost. In that spirit, this staff draft outlines a legislative proposal that would begin with a modest emissions-reduction target and strengthen gradually over time. The approach is consistent with that of the successful Acid Rain Program in that it sets a “forward price” on emissions to provide both the flexibility and incentive needed to accelerate technology development and deployment. The long-term price signal that a forward price creates would be critical for giving industry certainty and for focusing its decision-making on lower carbon options. However, the price signal initially imposed under any domestic regime would not likely be strong enough to motivate the development and deployment of the key technologies that will ultimately be needed to stop and reverse GHG emissions. Thus, in order to speed technology deployment, the staff draft includes provisions to create incentives for new technology and provides significant new R&D funding for low- and no-carbon technologies.

### Key Features

#### *Target, Timing and Price Cap*

- **Emissions Target:** The target is calculated in advance to reflect a 2.6 percent per year decline in the emissions intensity of the U.S. economy (expressed as total GHG emissions per dollar of GDP) for the first period of program implementation (2012 to 2021). The target rate of decline in emissions intensity increases to 3.0 percent per year in the second period (2022 onward). The emissions target establishes the total quantity of allowances available each year.
- **Price Cap:** The government would make additional allowances (above and beyond the quantity initially allocated under the emissions target) available for sale at a fixed price. The price starts at \$7 per metric ton of carbon-dioxide-equivalent GHG emissions in the first year of program implementation and rises steadily thereafter at an annual rate of 5 percent above the rate of inflation.

#### *Explanation of Approach*

- **Consistent with Sense of Senate Resolution:** By targeting an annual decline in emissions intensity, the proposal is designed to first slow emissions growth (over the period from 2012 through 2021), before attempting to stop emissions growth starting in 2022. Ultimately, emissions will need to decline in absolute terms to stabilize greenhouse gas concentrations in the atmosphere, meaning that the rate of decline in emissions intensity will eventually need to outpace economic

growth. This proposal establishes a policy framework for achieving a long-term trajectory of emissions reductions in what would necessarily be a phased process.

- **Limits Costs to the Overall Economy and Provides Price Certainty for Investors:** By making additional allowances available at a known price, the proposal effectively caps the costs imposed on the U.S. economy and on consumers. Additional allowances would be purchased (and emissions would exceed the economy-wide target) only if the market price of allowances were to rise above the price cap. The price cap increases by 5 percent each year above the rate of inflation so as to provide progressively stronger incentives for emissions abatement over time and to establish a predictable market signal for investors.
- **Changes from 2005 Bingaman Proposal:** Based on numerous comments received during the Committee’s discussion of this issue, implementation is delayed 2 years, from 2010 to 2012. This change will allow the current voluntary Administration program to run its full course before any new policy takes effect and will provide sufficient time to get the trading program in place. To compensate for the delay, the proposed bill accelerates the rate by which the cost cap increases, from 5 percent nominal to 5 percent above inflation. The bill also changes the targeted decline in emissions intensity from 2.4 percent per year to 2.6 percent per year in the first allocation period, and from 2.8 percent per year to 3.0 percent per year in the second period, to adjust for greater “business-as-usual” reductions in emissions intensity stemming from higher projected energy prices.

#### *Scope and Point of Regulation*

- **Scope:** The program is economy-wide.
- **Point of Regulation:** Carbon dioxide (CO<sub>2</sub>) emissions from fossil fuels are regulated upstream at the point of fossil fuel production, and regulated entities are required to submit allowances equal to the carbon content of fuels produced or processed at their facilities.
- **Regulated Entities:** Entities required to submit allowances include:
  - Petroleum refineries
  - Natural gas processing facilities
  - Coal mines
  - Fossil fuel importers (for petroleum, this includes refined products only) and importers of gases with high-global warming potential (GWP)
  - Non-CO<sub>2</sub> greenhouse gases: coal mine methane; N<sub>2</sub>O from adipic acid production; high-GWP gases

#### *Explanation of Approach*

- Placing the point-of-regulation relatively higher up in the progression from energy production to consumption reduces the number of sources that must be regulated

and simplifies program administration. This approach more efficiently captures all sources of emissions and all emissions reduction opportunities throughout the economy. In addition, an upstream approach may reduce overall administrative costs.

### *Allowance Distribution*

- **Allocation to Private Sector Entities:** For the first five years of program implementation, 55 percent of the total quantity of allowances available under the emissions target would be allocated without cost to private sector entities. This amount is gradually reduced to 0 percent over 30 years. The industry sectors receiving free allocations under this proposed approach are:
  - Coal mines and coal importers
  - Petroleum refineries and refined-product importers
  - Natural gas processing plants and natural gas importers
  - Non-CO<sub>2</sub> regulated entities
  - Coal, oil and natural gas electric generators
  - Carbon-intensive industrial sectors
- **Auction:** For the first five years of program implementation, 10 percent of the total quantity of allowances available under the emissions target would be auctioned. The share of allowances auctioned would gradually increase to 65 percent over 30 years. Auction revenues are used for R&D and to support the deployment of low- and no-carbon technologies.
- **Agricultural Sequestration:** 5 percent of the total quantity of allowances allocated under the emissions target annually would be for agricultural sequestration activities (see below).
- **Early Reduction Credits:** 1 percent of the total quantity of allowances allocated under the emissions target for each of the first 10 years would be reserved for entities that had undertaken projects resulting in early reductions in greenhouse gases.
- **Distribution by States or the President (to “fine tune” allocation):** 29 percent – 30 percent of the total quantity of allowances allocated under the emissions target:
  - States or the President would distribute allowances for certain defined purposes, such as addressing economic impacts, promoting technology or energy efficiency, and enhancing energy security.
  - If States distribute allowances, their overall amount would be based half on emissions and half on population.

## *Explanation of Approach*

- **Allocation Based on Cost Impacts:** Under the proposal, allowances are allocated in a manner that recognizes and roughly addresses the disparate costs imposed by the program. Allowances are not allocated solely to regulated entities because these entities do not bear all or even most of the costs of the emissions trading program.
- **Auction Phased in Over Time:** Over time, allowance distribution transitions from an approach that fairly compensates sectors for past investments in carbon-intensive technologies to an approach that creates incentives for energy efficiency and lower carbon technologies. This is accomplished by gradually reducing the quantity of allowances given away without cost while gradually increasing the quantity of allowances auctioned.
- **Auction Proceeds for Technology R&D and Incentives:** Virtually all experts agree that significant technology advancements will be needed to adequately and affordably address climate change over the next century. Reserving proceeds from the auction for energy research, development, and deployment would provide the revenue to support significant new development and deployment of the breakthrough technologies needed to address climate change.
- **Allocation for Primary Fuel Producers:** The compliance costs for fossil fuel producers in an upstream system represent only a small portion of the overall costs of any trading program. Most upstream producers can and would simply pass allowance costs through in the form of higher fuel prices, regardless of whether they were to receive free allowances or were required to pay for them. Analysis shows that costs to primary fuel producers would be completely offset by an allocation of roughly 5 percent to 10 percent of the total pool of allowances. However, the EIA analysis of last year's proposal by Senator Bingaman shows that coal companies, while able to pass a substantial portion of their costs through in prices, might be more affected than other energy producers. Although coal demand and sales would continue to grow under the proposed GHG trading program, coal use is projected to grow more slowly under the program than in the absence of regulatory action. Accordingly, the proposal acknowledges the slower growth in coal demand expected as a result of the bill and allocates 7 percent of the total pool of allowances available under the emissions target to coal producers. Oil and gas producers would receive 4 percent and 2 percent, respectively, of that total allowance pool.
- **Allocations for Downstream Electric Generators:** Although electric generators would not be regulated under the staff draft proposal, they would face higher production costs as fossil fuel prices rise. A portion, though not all, of these additional fuel costs would be passed through in higher electricity prices. To the extent that generators were to receive allocations of free allowances, they would be able to sell those allowances and use the revenue to offset higher fuel costs. Based on cost estimates provided by EIA, further analysis suggests that a 10

percent share of the total allocation would fully offset adverse impacts on electric generators. The 10 percent figure assumes that the allocation system perfectly targets allowances to the companies that bear non-recoverable costs. Recognizing that a perfectly targeted allocation is not possible and that some “passed through” costs would revert to fossil-based electric generators, a higher fraction would need to be allocated to fossil generators to fairly offset the impacts of increased fuel prices. If, in the extreme, fossil generators were to bear all program costs without passing any along to rate payers, they would need 40 percent of the total allocation pool to offset their costs. Therefore, between 10 percent and 40 percent of the total allocation reflects the theoretical range of allowances needed to offset the financial impact of increased fuel prices in the electric sector. Using a point in this range, the draft allocates 30 percent of the total pool of allowances available under the emissions target (equal to roughly 75 percent of electricity sector emissions) to fossil-fuel fired generation.

- **Allocations for Carbon-Intensive Industries:** Energy-intensive industries, such as steel, aluminum, chemicals, pulp and paper, and cement, would not be regulated in an upstream trading system. Like electric generators, these industries would, however, face higher prices for fossil fuels under a greenhouse gas trading system. While price increases would be modest, these industries consume significant amounts of fossil fuels and often face stiff competition from foreign competitors, most of whom would not be subject to mandatory greenhouse gas regulation. Including these industries in the allocation would not affect their incentive to improve efficiency and reduce fuel use, but it would offset increased energy costs and help to address competitiveness concerns associated with a domestic greenhouse gas trading program. If one provided allocations of free allowances only to the large, energy-intensive industries noted above—steel, aluminum, chemicals, and pulp and paper—close to 10 percent of the overall allowance pool would be required. The proposal allocates 10 percent of the total annual allocation towards carbon-intensive industries.
- **Allowance Pool to “Fine Tune” Allocation:** Although the approach outlined above generally addresses the cost impacts of the proposal, we recognize that costs are imposed on additional groups and that it may be desirable to address additional policy goals through the allocation process. Therefore, a significant portion of allowances is reserved for these purposes. These allowances would go towards several specific purposes, such as addressing economic impacts, creating incentives for energy efficiency or other “climate friendly” technologies, and enhancing energy security. The proposal presents two options for distributing these allowances: either States would distribute the allowances or the allowances would be distributed according to a process designated by the President.
- **Early Reduction Programs:** For the first ten years, 1 percent of the total pool of allowances available annually under the emissions target would be set aside for an early reduction credit program that would award allowances to companies or other organizations that reduced emissions prior to the implementation of a

mandatory program. These include reductions reported through DOE/EIA's 1605b program, and reductions made through other government-sponsored and private programs identified by the Secretary of Energy.

#### *Offset Projects*

- **Cost-Effective Reductions:** Allowances could be provided for cost-effective emissions reductions not otherwise covered by the trading program (e.g., capturing and using methane from landfills).
- **Tiered System:** The proposal would establish a tiered system of offsets whereby the most easily verified project types could use a streamlined procedure to apply for allowances.

#### *Explanation of Approach*

- Offset projects can provide low-cost emission reductions and create incentives for new technologies and approaches. The proposed approach would encourage investor certainty and lower transaction costs while ensuring that offset projects have environmental integrity.

#### *Incentives for Farmers*

- **Agricultural Sequestration:** The proposal creates a significant new pilot program to encourage and evaluate the benefits of agricultural soil sequestration.
- **Allowance Set-Aside:** 5% of the total pool of allowances available annually under the emissions target would be reserved for sequestration projects by farmers.

#### *Explanation of Approach*

- Sequestration of carbon in agricultural soils is a potentially important option for addressing greenhouse gases and could eventually create a significant new source of revenue for farmers. However, there is relatively little long-term experience with monitoring, reporting and verifying agricultural sequestration. Providing agricultural sequestration projects with allowances *from within the pool of allowances established under the program target* would allow the nation to benefit from large-scale demonstration projects aimed at resolving some of these issues, while still ensuring that the program achieves its intended environmental goals. Thus, 5 percent of the initial allowance pool would be reserved to provide incentives for agricultural sequestration projects.

### *International Linkages*

- **Review of Actions by Trade Partners and Large Emitters:** Planned increases in the target rate of emissions intensity reductions and in the price cap could be halted or modified if, during a review process that would occur every five years (Five-Year Review), it were determined that major trade partners and other large emitters were not taking appropriate actions to address greenhouse gases.
- **Consider Implications of Linking to Other Trading Programs:** The Five-Year Review Process also provides an opportunity to consider linking the U.S. program to other countries' domestic GHG reduction programs.

### *Explanation of Approach*

- All stakeholders recognize the need to encourage comparable action by other nations that are major trading partners and key contributors to global GHG emissions. The draft acknowledges that the U.S. should show leadership by taking action on greenhouse gases. However, after the initial stage, further steps would be contingent on a review of progress by other nations in addressing their GHG emissions.
- Differences in the design of domestic trading programs (e.g., different target levels, different monitoring and verification systems) might complicate efforts to link programs internationally, especially in the near-term. Thus, rather than providing a provision for formal linkage now, the draft leaves further consideration of these issues to the Five-Year Review process.



## **Appendix D. Follow Up Request Letter**

PETE V. DOMENICI, New Mexico, Chairman  
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 CRAIG THOMAS, Maryland  
 LAMAR ALEXANDER, Tennessee  
 J. CAROL ROBERTS, Kansas  
 RICHARD BURSE, North Carolina  
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 ROBERT MENENDEZ, New Jersey

## United States Senate

COMMITTEE ON  
 ENERGY AND NATURAL RESOURCES

WASHINGTON, DC 20510-8150

ENERGY.SENATE.GOV

October 11, 2006

Dr. Howard Graenspecht  
 Deputy Administrator  
 Energy Information Administration  
 U.S. Department of Energy  
 1000 Independence Avenue, SW  
 Washington, DC 20585

Dear Dr. Graenspecht:

This letter follows up on the request of September 27, 2006, that EIA provide an analysis of draft climate legislation. Since the time of that request, I have identified three specific issues that I would like to see explicitly addressed in EIA's report: 1) the impact of higher and lower starting prices for the program's "safety valve" price; 2) the impacts of allowing GHG offsets and the potential impact of not permitting or limiting them; and 3) the impact on program costs and the distribution of those costs associated with using a different point of regulation, specifically an alternative in which the point of regulation for coal was downstream (i.e., at electric power plants and industrial sources). While I would like EIA's report to address these issues, it is not necessary to provide a full presentation of all alternative cases that are run to develop insights into these issues.

Please do not hesitate to contact me if you have any questions regarding this additional request.

Sincerely,



Jonathan Black