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**Prepared for**

**Coalition for Affordable American Energy  
(CAAE)**

# Impact on the Economy of the Climate Provision in the Obama Administration's FY 2010 Budget Proposal

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Alaska Chapter of ABC  
American Apparel & Footwear Association  
American Foundry Society  
American Hotel & Lodging Association  
American Supply Association  
American Wholesale Marketers Association  
Arizona Builders Alliance of ABC  
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Arkansas Asphalt Pavement Association  
Arkansas Chapter of ABC  
Asphalt Paving Association of Iowa  
Associated Builders & Contractors  
Associated Equipment Distributors  
Associated General Contractors of Alabama  
Associated General Contractors of Alaska  
Associated General Contractors of America  
Associated General Contractors of Arkansas  
Associated General Contractors of California  
Associated General Contractors of D.C.  
Associated General Contractors of East Tennessee  
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Baltimore Metro Chapter of ABC  
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Central California Chapter of ABC  
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Central Michigan Chapter of ABC  
Central Ohio Chapter of ABC  
Central Pennsylvania Chapter of ABC  
Central Texas Chapter of ABC  
Chamber of Commerce of the U.S.  
Chesapeake Chapter of ABC  
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East Tennessee Chapter of ABC  
Eastern Pennsylvania Chapter of ABC  
Eastern Shore Chapter of the ABC  
Empire State Chapter of ABC  
FEWA-Marketing & Distribution Association  
Florida East Coast Chapter of ABC  
Florida First Coast Chapter of ABC

Florida Gulf Coast Chapter of ABC  
Food Industry Suppliers Association  
Foodservice Equipment Distributors Association  
Forging Industry Association  
Gases and Welding Distributors Association  
General Contractors Association of Hawaii  
Georgia Chapter of ABC  
Golden Gate Chapter of ABC  
Greater Houston Chapter of ABC  
Guam Contractors Association of ABC  
Hawaii Chapter of ABC  
Health Industry Distributors Association  
Healthcare Distribution Management Association  
Heart of America Chapter of ABC  
Heating, Airconditioning & Refrigeration Distributors  
International  
Heavy Constructors Association of Greater Kansas  
City  
Idaho Associated General Contractors  
Illinois Asphalt Pavement Association  
Illinois Chapter of ABC  
Independent Distributor Association  
Independent Electrical Contractors  
Indiana Chapter of ABC  
Industrial Fasteners Institute  
Industrial Supply Association  
Inland Northwest AGC  
Inland Pacific Chapter of ABC  
International Association of Ice Cream Vendors  
International Association of Plastics Distribution  
International Foodservice Distributors Association  
International Franchise Association  
International Sanitary Supply Association  
International Sealing Distribution Association  
International Truck Parts Association  
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Irrigation Association  
Kansas Contractors Association  
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Keystone Chapter of ABC  
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Lawn & Garden Marketing and Distribution Association  
Los Angeles-Ventura Chapter of ABC  
Maine Chapter of ABC  
Maryland Chamber of Commerce  
Massachusetts Aggregate & Asphalt Pavement Association  
Massachusetts Chapter of ABC  
Material Handling Equipment Distributors Association  
Metals Service Center Institute  
Metro Washington Chapter of ABC  
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Minnesota Chapter of ABC  
Mississippi Chapter of ABC  
Montana Contractors' Association  
Motorcycle Industry Council  
National Asphalt Pavement Association  
National Association of Chemical Distributors  
National Association of Electrical Distributors  
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National Association of Sign Supply Distributors  
National Association of Wholesaler-Distributors  
National Electrical Contractors Association  
National Fastener Distributor Association  
National Federation of Independent Business  
National Field Selling Association  
National Funeral Directors Association  
National Lumber and Building Material Dealers Association

National Marine Distributors Association  
National Paint and Coatings Association  
National Paper Trade Association Alliance  
National Poultry & Food Distributors Association  
National Retail Federation  
National Roofing Contractors Association  
National School Supply & Equipment Association  
National Tooling & Machining Association  
National Wood Flooring Association  
New Hampshire/Vermont Chapter of ABC  
New Jersey Chapter of ABC  
New Mexico Building Branch of the Associated General  
Contractors  
New Mexico Chapter of ABC  
New Orleans/Bayou Chapter of ABC  
North Alabama Chapter of ABC  
North American Association of Floor Covering  
Distributors  
North American Building Material Distribution  
Association  
North American Horticultural Supply Association  
North American Wholesale Lumber Association  
North Florida Chapter of ABC  
North Texas Chapter of ABC  
Northern Ohio Chapter of ABC  
NPES-The Association for Suppliers of Printing, Publishing  
and Converting Technologies  
Ohio Valley Chapter of ABC  
Oklahoma Asphalt Pavement Association  
Oklahoma Chapter of ABC  
Outdoor Power Equipment & Engine Service Association  
Pacific Northwest Chapter of ABC  
Pelican Chapter of ABC  
Pet Industry Distributors Association  
Petroleum Equipment Institute  
Power Transmission Distributors Association  
Rhode Island Chapter of ABC  
Rocky Mountain Chapter of ABC  
Roofing & Sheet Metal Contractors Association of Georgia,  
Inc.  
Roofing Contractors Association of California  
Roofing Contractors Association of Western Pennsylvania  
Safety Equipment Distributors Association  
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San Diego Chapter of ABC  
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Union Roofing Contractors Association  
Utah Chapter of ABC  
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Western Colorado Chapter of ABC  
Western Michigan Chapter of ABC  
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Wholesale Florist & Florist Supplier Association  
Wisconsin Chapter of ABC  
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Woodworking Machinery Industry Association

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This report describes the conclusions of the individual authors and does not necessarily represent a position of CRA International or of its clients

## EXECUTIVE SUMMARY

CRA International is a leading global consulting firm that has provided economic, financial, strategy and business management advice to public and private sector clients since 1965. CRA serves clients from offices on four continents.

As requested by the Coalition for Affordable American Energy (CAAE), CRA International has used its state-of-the-art MRN-NEEM and MS-MRT modeling systems to analyze the potential economic impacts of the climate provisions contained in the Obama Administration's FY 2010 Budget Proposal sent to the U.S. Congress. All projections in this analysis were based on these models and publicly available data. The study examined the Cap and Trade policy described in the Administration's FY 2010 Budget Proposal, including the stated caps on U.S. greenhouse gas emissions and proposals for use of the revenues to fund renewable energy programs, the "Making Work Pay" tax credits, and other transfer payments. The analysis focused on how these could affect key performance metrics of the United States' economy.<sup>1</sup>

The report finds that the climate provisions of the Administration's proposed FY 2010 budget would be expected to have significant economic and energy market impacts. The model results indicate that market shares would shift within the energy sector. Natural gas is projected to expand its market share, particularly for power generation. Increased imports of natural gas are estimated to supply most of the increased domestic demand for natural gas, whereas domestic natural gas production is projected to increase only slightly. Both oil and coal are estimated to decline in market share. These measures would tend to lower rates of return on investments in the production of domestic oil, and petroleum products. With lower rates of return, domestic investment levels would be expected to fall. Domestic crude oil and refined products production are projected to decline. The share of renewable energy is estimated to rise. Total energy consumption in the U.S. economy is estimated to contract.

The model results also indicate that business users and consumers would face higher energy costs. The resulting higher energy production and transportation costs in-turn would lead to increased costs of other goods and services throughout the economy. As the costs of goods and services rise, household disposable income and household consumption would fall. As explained in the body of the report, the Cap and Trade policy would be expected to have the effect of causing more investment in costly forms of renewable energy, thereby directing funding away from investments with greater potential to enhance productivity, so that the economy would grow more slowly and job growth would decline. Overall, the economy would be expected to grow more slowly, leading to substantial differences in disposable income and personal consumption.

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<sup>1</sup> The President's budget states his intention to work with Congress to develop greenhouse gas legislation. This analysis deals exclusively with the proposals in the President's budget, and does not include any other provisions that might be added in Congress, such as use of offsets, different formulae for using revenues or allocating allowances, banking of allowances, or additional regulatory measures.

## 1.1 IMPACTS ON ECONOMIC PERFORMANCE

Specific impacts<sup>2</sup> on economic performance of the Climate Provisions in the Obama Administration's FY 2010 Budget Proposal, which would begin in the year 2012, include the following:

- **Carbon Allowance Costs** - The climate provisions contained in the Obama Administration's FY 2010 Budget Proposal would result in reduced carbon emissions through decreased use of conventional energy. As the cap progressively tightens with time, the cost of reducing emissions becomes more expensive and as a result, the cost of a carbon allowance increases. In 2015, the cost of a carbon allowance is estimated to be \$29/ metric ton of carbon dioxide. By 2020, the allowance cost could increase to \$66/metric ton of carbon dioxide and by 2030, the allowance cost could reach \$116/metric ton of carbon dioxide.
- **Energy Costs** - The cost of energy paid by business users and consumers is projected to increase. The cap and trade provision is projected to result in the substitution away from less costly conventional fuels. Natural gas demand, primarily for electricity generation, is projected to increase as coal-generated electricity is backed out due to tightening GHG emission caps. Motor fuel costs are projected to increase as allowances would need to be purchased for the emissions associated with the use of motor fuels. In particular, after an estimated 39% increase (\$4.70 per MMBtu) in natural gas costs by 2020 relative to the AEO 2009 Baseline level<sup>3</sup>, natural gas costs are estimated to increase by 56% (\$7.20 per MMBtu) by the year 2025, again relative to the baseline. After an estimated 48 cents per gallon increase in 2020, motor fuels are estimated to increase by 19% (74 cents per gallon) relative to baseline levels. Electricity costs are estimated to increase by 27% (3.6 cents per kWh) relative to baseline level in 2020, rising by 44% (5.8 cents per kWh) in 2025.
- **Job Losses** - After an estimated initial net job loss of 800,000 in 2015, net job losses are projected to more than double by 2020 to 1.9 million and continue to mount to a net loss of approximately 3.2 million total jobs by 2025 from baseline levels. This estimated employment impact is inclusive of jobs that would be created due to increased funding of renewable energy and the "Making Work Pay" provision as specified in the Obama Administration's proposed 2010 budget. While all regions of the country would be adversely impacted, the Southeast, Oklahoma, Texas, and California would be disproportionately affected.

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<sup>2</sup> All costs are expressed in terms of 2008 dollars.

<sup>3</sup> Results herein are reported as changes from the EIA Annual Energy Outlook 2009 Early Release Reference Case.

- **Household Purchasing Power** - Projected impacts on household purchasing power would be severe and follow a pattern similar to employment impacts. Per household purchasing power is estimated to decline by \$1,020 in 2015, by \$1,381 in 2020 and by 2030 the average American household's annual purchasing power is estimated to diminish by approximately \$2,127. This is after the recycling of revenues from auctioning carbon allowances back to households as specified in the Administration's FY 2010 Budget Proposal is taken into account.
- **Investment** - Aggregate U.S. investment is projected to drop by 1.3% below baseline level in 2015, but then is projected to increase over the 2020 – 2030 timeframe as required investments in lower emitting GHG technologies and energy efficiency improvements are put in place in order to comply with ever more stringent carbon caps. By 2030, investment is estimated to be 5.6% above baseline level. The increasingly stringent carbon caps would be expected to redirect capital from higher to lower productive uses, for example, by forcing premature retirement and abandonment of conventional energy technologies and sources, deferring productivity enhancing investments across a large swath of the manufacturing sector to enable installment of equipment to reduce GHG emissions, and channeling capital into more expensive lower GHG emitting technologies. This investment shift would be expected to have a disproportionately large adverse impact on future productivity growth.
- **Overall Economic Activity** - By 2025, GDP, a commonly used measure of total economic activity, is estimated to be roughly 0.7% (\$150 billion) below the baseline level driven principally through declining consumption. Commercial transportation services, electric generation and agriculture would be among the disproportionately affected economic sectors. In 2030, GDP is estimated to be roughly 0.2% (\$39 billion) below the baseline level. This is a temporary effect resulting from the need for substantial investments in order to comply with the tightening of future year emission caps.

## 1.2 IMPACTS ON THE ENERGY SECTOR

Implementation of the Climate provisions in the Administration's Budget would result in significant changes to energy supply and consumption.

- **Natural Gas Demand** - A Cap and Trade policy is projected to force a shift towards the use of natural gas in the next decade in large measure because of increased use of natural gas for electricity generation. By the year 2025, the nation's demand for natural gas is estimated to increase by 3.0 Tcf relative to the baseline level. This demand increase would result in an estimated cost increase of natural gas to consumers of 56% (\$7.20 per MMBtu) relative to the baseline level by the year 2025. By 2030 the impact on demand lessens to 1.5 Tcf. This is due to the need to move away from natural gas fired generation in order to comply with the ever more stringent emission caps.
- **Natural Gas Supply** - A majority of the estimated natural gas demand growth is projected to be met by natural gas imports, not by increases in domestic production. Increased costs on domestic oil and natural gas producers generally retard development of domestic natural gas resources. By the year 2025, natural gas imports are estimated to rise by 160% (2.0 Tcf) above the baseline level, whereas domestic natural gas production is estimated to increase by only 5% (0.7 Tcf) again relative to the baseline level.
- **Competitiveness** - The projected increased costs imposed on US-located refineries to cover facility GHG emissions under the Obama Administration's proposed Cap and Trade provision would not be faced by many refineries located outside the U.S., which would put U.S. refineries at a competitive disadvantage.
- **Petroleum Markets** - The effects of the proposed Cap and Trade policy are projected to reduce demand for refined products, and this decline would fall disproportionately on U.S. producers. U.S. production of refined products is projected to decline relative to baseline levels by 604 - 2,151 MBOE/day (3.9 to 13.6% annually) over the 2020-2030 period.

Overall, the Cap and Trade proposal in the Obama Administration's FY 2010 Budget Proposal is designed to raise the cost of using conventional energy – by requiring emission allowances for the use of that energy – effectively restricting the use of lower cost energy in the U.S. economy. Higher energy costs would likely reduce total consumption, employment, and economic output. The link between energy supply and its cost, and economic performance is the key to understanding the pattern of the study results and central to an assessment of the implications of the Administration's FY 2010 Budget Proposal. Table 1.1 provides a summary of economic impacts.

**Table 0.1: Summary of Projected Economic Impacts (Change from Projected Baseline)**

	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
U.S. Job Losses (Millions)	0.8	1.9	3.2	3.2
Change in U.S. Household Purchasing Power (\$2008 per Household)	-\$1020	-\$1,381	-\$1,823	-\$2127
Percent Change in U.S. GDP	-0.3%	-0.4%	-0.7%	-0.2%
Percent Change in U.S. Investment	-1.3%	+0.6%	+0.3%	+5.6%
Percent Change in Natural Gas Cost (\$1.90 /MMBtu)	16%	39%	56%	53%
		(\$4.70 /MMBtu)	(\$7.2 0/MMBtu)	(\$7.70 /MMBtu)
Percent Change in Motor Fuel Cost (21 Cents/Gallon)	6%	13%	19%	20%
		(48 Cents/Gallon)	(74 Cents/Gallon)	(78 Cents/Gallon)
Percent Change in Electricity Cost (2 Cents/ kWh)	15%	27%	44%	51%
		(3.6 Cents/ kWh)	(5.8 Cents/ kWh)	(6.6 Cents/ kWh)

## **1. BACKGROUND**

### **2.1 THE ADMINISTRATION'S FY 2010 BUDGET**

On February 26, 2009 the Obama Administration unveiled its FY 2010 Budget Proposal. The budget contains proposals for new spending programs and a restructuring of the way the government raises revenues to pay for these programs.

The Administration's budget called for new investments. In the energy sector, the subject of this analysis, the budget document stated a goal of doubling U.S. renewable energy capacity within the next three years. It went on to call for a range of measures designed to promote energy savings.

The energy-related components of the Administration's budget also contain a number of new revenue-raising provisions. These provisions are linked to three goals. First, they are designed to fund some of the new investments. Second, they are meant to curtail domestic greenhouse gas emissions, and, third, they are intended to offset the loss in government revenue associated with extending the "Making Work Pay" tax reduction.

### **2.2 THE BUDGET'S CLIMATE PROVISIONS**

The Obama Administration's FY 2010 Budget Proposal contains a series of revenue-raising measures. By far the largest of these revenue-raising provisions is the proposed imposition of a cap-and-trade system. Cap-and-Trade is not just a plan to raise revenue. It is also intended to reduce emissions into the atmosphere of greenhouse gases. The details of the structure of the Cap and Trade policy are likely to greatly influence the plan's economic implications.

The analysis also examines the use of the funds raised by the proposed GHG emission allowance auctions. The Budget envisions distributing these funds for two purposes. In part, it proposes to distribute \$15 billion annually to promote renewable energy. The remainder of the auction receipts is used to offset the outlays allocated to the proposed "Making Work Pay" tax credit. The Methodology section explains the analysis of these provisions, and the Results section of this report describes the findings.

### **2.3 STUDY OBJECTIVES**

This study evaluates the potential economic impacts of the Climate provisions of the Obama Administration's FY 2010 Budget Proposal. Government fiscal policy exacts economic resources (labor, materials, land and capital) from some activities. It also uses those resources to subsidize other behavior. Thus, fiscal policy affects the pattern of activity within an economy. The cap and trade system would change the resource allocations among the various components of the energy sector. It would boost the scale of some enterprises, and shrinks the scale of others. Such policies can also change the distribution of economic activity across sectors and regions of the economy.

This study will examine the climate provisions of the Obama Administration's FY 2010 Budget Proposal as it relates to the energy sector from both of these perspectives. It will also assess the principal climate provisions projected effects on economic activity across sectors and regions.

Many of the impacts produced by fiscal policy can ripple through the economy. Some of these impacts can affect activities that are seemingly distant from the first point of policy intervention. Therefore, the task of tracing the impacts of a policy requires use of comprehensive and detailed models. The CRA models used in this analysis simulate the operations of major features of the U.S. economy and its energy system, so that it is possible to trace the many pathways through which legislation can affect various economic sectors and activities.

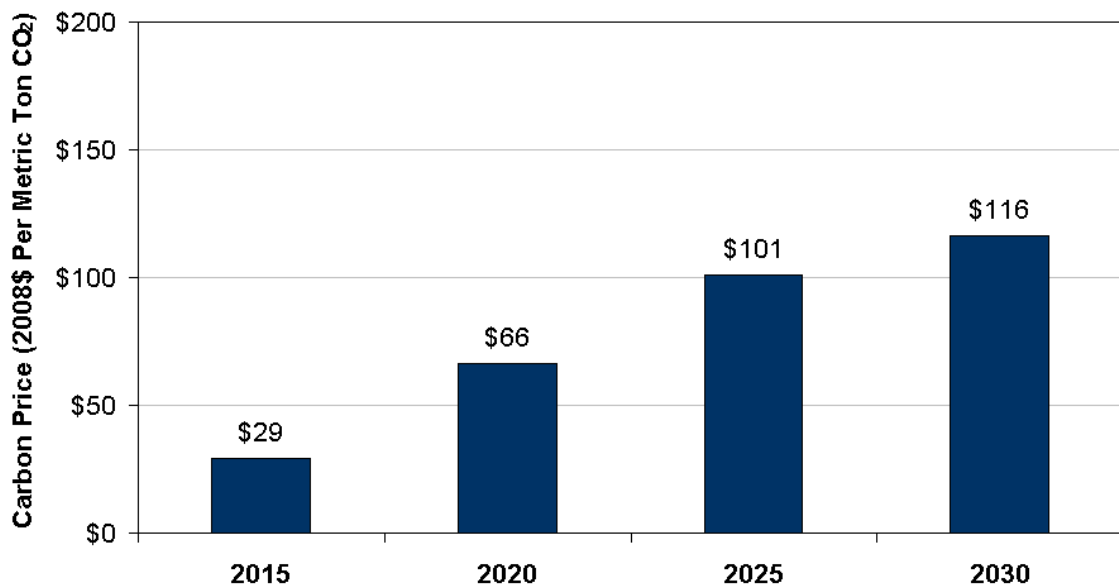
In particular, CRA International used its state-of-the-art MRN-NEEM and MS-MRT modeling systems to analyze the potential impacts on domestic energy markets and the economy of these budget proposals. The analysis assesses how the budget proposal would likely affect key performance metrics of the United States' economy. The models are described more fully in the methodology section of this report.

## 2. RESULTS

The objective of the climate provisions contained in the Obama Administration's FY 2010 Budget Proposal is to implement a Cap and Trade policy that would reduce carbon emissions by decreasing the use of conventional energy. This would be achieved by limiting the availability of "allowances" required for the use of that energy, thereby increasing energy costs to the U.S. economy. As the cap progressively tightens with time (i.e. allowances become scarcer), the marginal source of reducing emissions becomes more expensive because the lower cost sources of reducing emissions were used earlier. As a result, the price of a carbon allowance increases with time as the cap becomes more stringent.

Figure 3.1 presents estimates of the carbon allowance price with time. In 2015, with the climate provisions proposed in the Obama Administration's FY 2010 Budget, the price of a carbon allowance is estimated to be \$29/ metric ton of carbon dioxide. By 2020, the allowance price could increase to \$66/metric ton of carbon dioxide. By the 2025, the allowance price could increase further to \$101/metric ton of carbon dioxide. By 2030, the allowance price could reach \$116/metric ton of carbon dioxide.

**Figure 2.1: Projected Carbon Allowance Prices due to the Climate Provisions in the Obama Administration's FY 2010 Budget Proposal**



Source: CRA Model Results, 2009

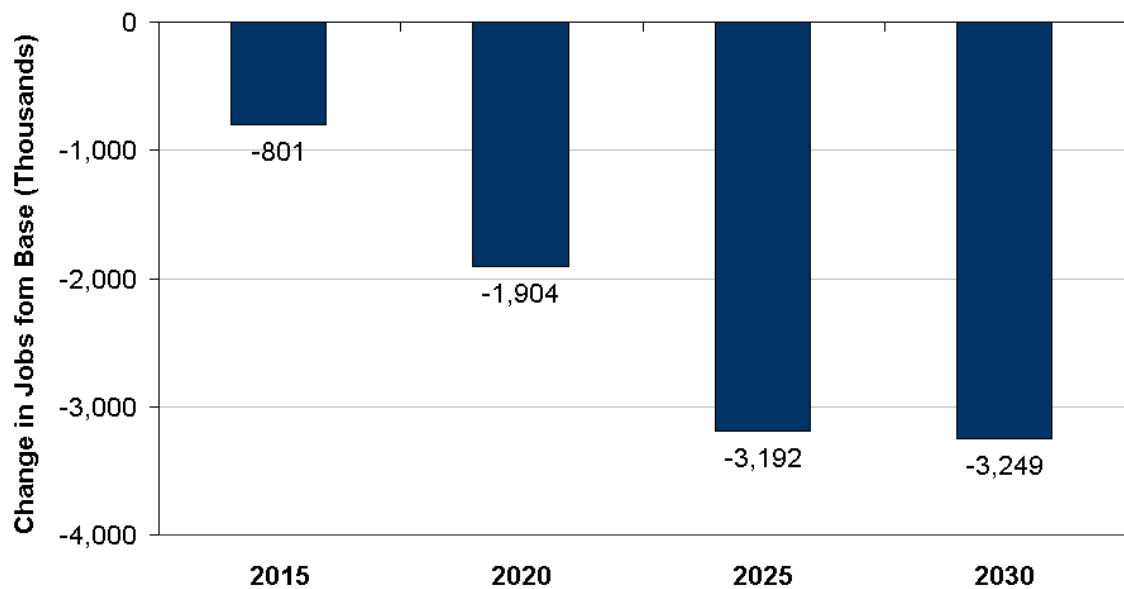
The economic impacts resulting from the increasing carbon allowance prices would be expected to cascade through the economy and would likely increase energy costs and decrease production and consumption across a wide array of goods and services. The size of the projected impacts varies by region but the direction does not. The projected impacts increase through the period analyzed (2015 - 2030) as the measures become more severe with the largest changes projected over the 2025 to 2030 period.

### 3.1 ECONOMIC IMPACTS

#### 3.1.1 Non-Farm employment impacts

Higher energy costs would likely cause decreases in demand for the quantities of goods and services produced by the economy. In addition, as the expected costs of energy services climb, the productivity of capital and labor tend to fall. Business activity is likely to contract relative to the levels that would have prevailed without policy-induced energy cost hikes. The demand for labor would tend to weaken, and employment is projected to decline, again, relative to that which would have prevailed without the higher energy costs. Figure 3.2 illustrates that for 2015 job losses are estimated to be approximately 0.8 million, more than double by 2020 to 1.9 million job losses, and by 2025 - 2030, when the provisions become even more constraining, job losses are projected to increase to approximately 3.2 million compared to baseline levels. These estimated employment impacts are inclusive of jobs that would be created due to increased funding of renewable energy and the "Making Work Pay" provision as specified in the Obama Administration's FY 2010 Budget Proposal<sup>4</sup>.

**Figure 2.2: Projected Changes to Non-Farm Employment due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**

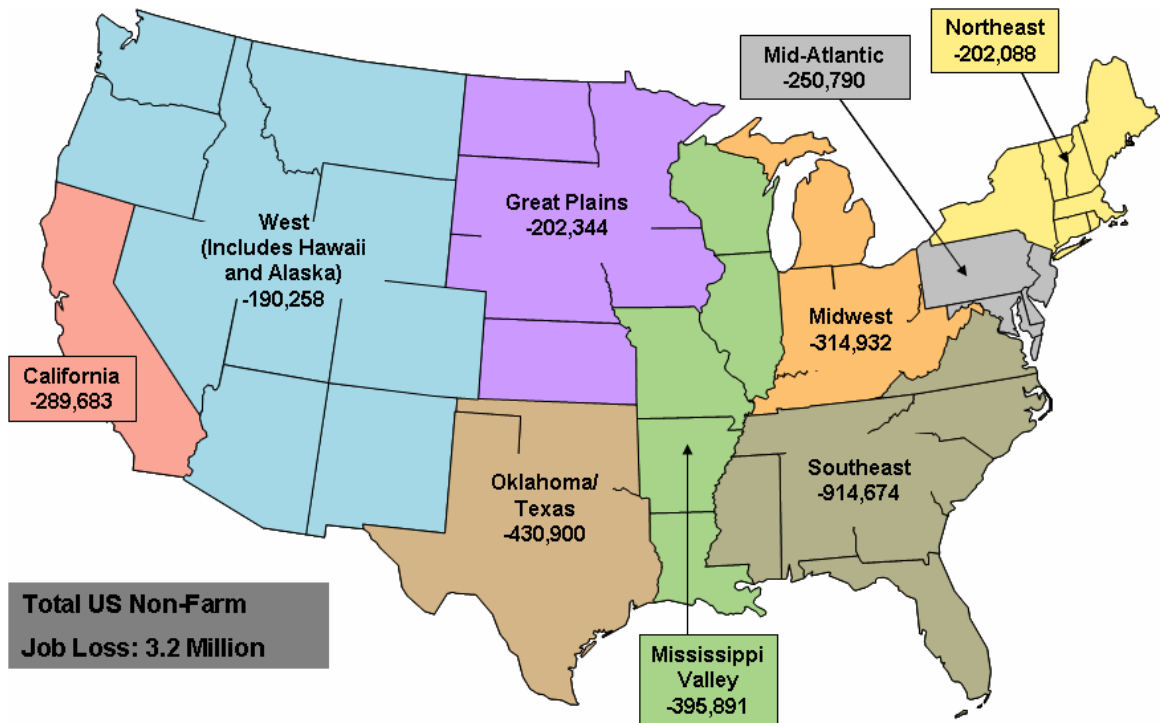


Source: CRA Model Results, 2009

<sup>4</sup> We calculate job loss in terms of "job-equivalents" based on the earnings of a full time worker earning the average wage in order to avoid the distorted implications for the average wellbeing of workers that simply "counting heads" with jobs implies.

Figure 3.3 indicates that the job losses projected from the climate provisions of the Obama Administration's FY 2010 Budget Proposal would be distributed throughout the country. In some cases, like commercial transportation, energy intensive activities are geographically widely dispersed. In other instances, like energy intensive manufacturing and petroleum refining/petrochemical production, activities are more geographically concentrated. The Southeast, California, Oklahoma, and Texas are important centers for these industries. The model results indicate that these regions would be disproportionately affected though all regions would be adversely impacted.

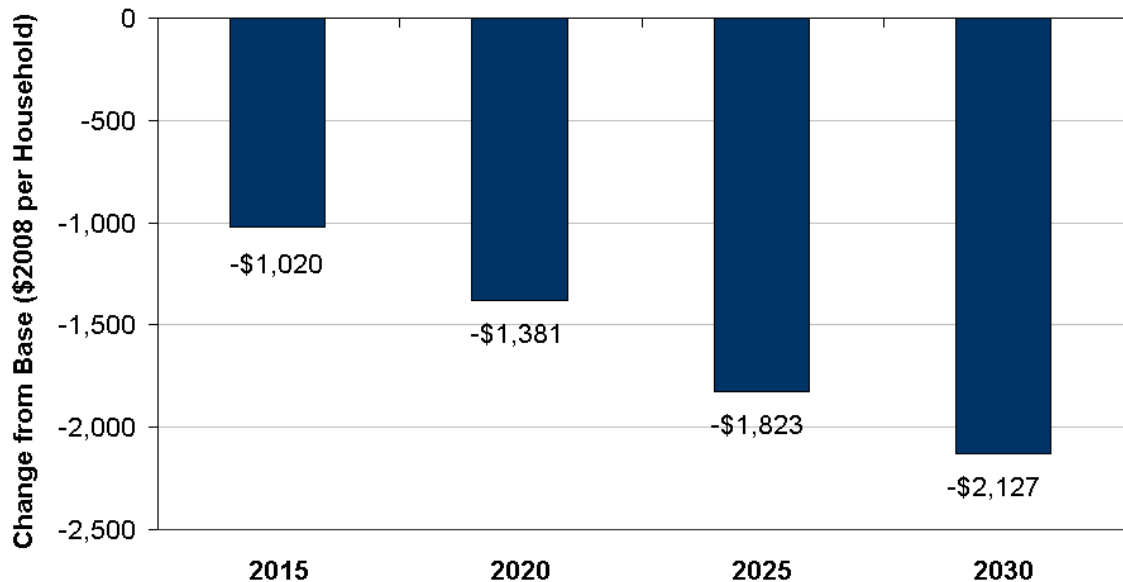
**Figure 2.3: Projected Regional Distribution of Changes to Non-Farm Employment in 2025 due to Energy Provisions in the President's FY 2010 Budget Proposal**



### 3.1.2 Impacts on household consumption

Higher energy costs generally mean that consumers must spend a larger percentage of their income to maintain their current level of household energy services. At the same time, significant quantities of energy are needed to produce and transport the many non-energy goods and services. The projected higher costs of these goods and services would be expected to magnify the loss in household purchasing power associated with the direct purchase of energy services. At the same time, higher energy costs would likely lead to reduced worker productivity and lower wage earnings, while reduced returns on investment would tend to lower household income from savings and retirement funds. Figure 3.4 estimates the increasing erosion of household purchasing power that the Climate Provisions in the Administration's Budget Proposal would likely cause through the combination of these factors. These estimates of changes in household purchasing power include the benefits of the Making Work Pay tax credit that increases after-tax income for some segments of the population.

**Figure 2.4: Projected Impact on Household Purchasing Power due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**



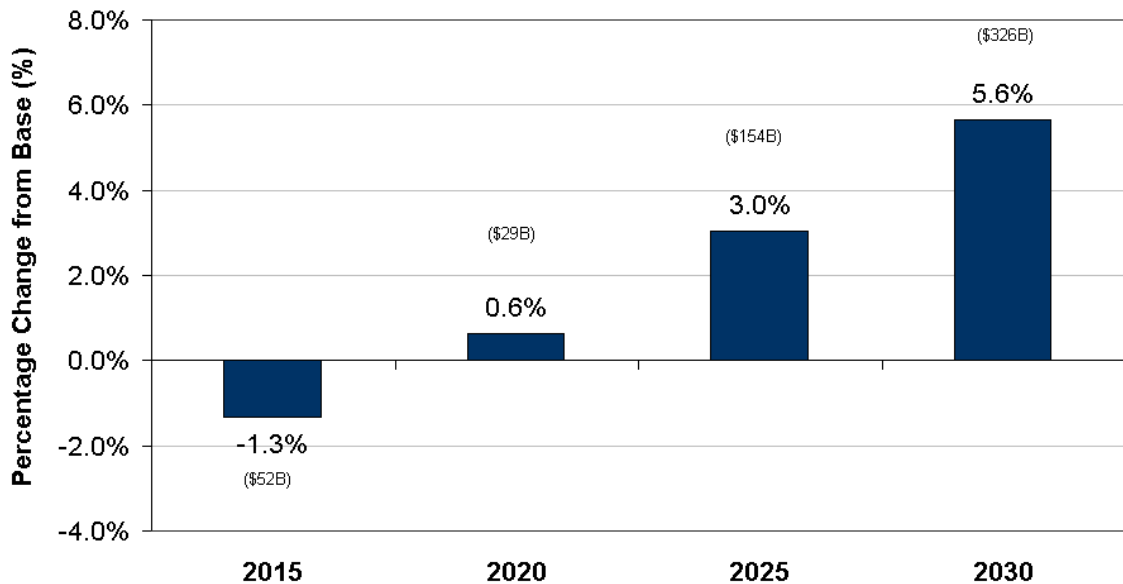
Source: CRA Model Results, 2009

The figure reveals the expected pattern of increasing losses through time. In 2015, the average household in the U.S. is estimated to experience a loss in purchasing power of roughly \$1020 relative to the baseline level. This loss grows over time to \$1,381 per household in 2020, and \$1,823 per household in 2025. By 2030, the estimated impact is more than double that in 2015 and average household's purchasing power is projected to decline by roughly \$2127, again, relative to the baseline level. These results include the impacts of the Obama Administration's "Making Work Pay" provision.

### 3.1.3 Aggregate investment

The proposed Climate Provisions are expected to require large investments in technologies to reduce greenhouse gas emissions. With time the level of these investments are projected to increase because the emissions cap becomes more and more stringent requiring not only more technology, but also the implementation of more expensive technologies to reduce emissions. As shown in Figure 3.5, aggregate U.S. investment is projected to drop by 1.3% below baseline level in 2015, but then is projected to increase over the 2020 – 2030 timeframe as investments in lower emitting GHG technologies and energy efficiency improvements are put in place in order to comply with ever more stringent carbon caps. By 2030, investment is estimated to be 5.6% above baseline level. The increasingly stringent carbon caps would be expected to redirect capital from higher to less productive uses, for example, by forcing premature retirement and abandonment of conventional energy technologies and sources (e.g. coal mining, coal-generated electricity units, crude oil and refined products production) and deferring productivity enhancing investments across a large swath of the manufacturing sector to enable installment of equipment to reduce GHG emissions. This projected investment shift would significantly reduce investments contributing to future productivity growth.

**Figure 2.5: Projected Impact on Aggregate U.S. Investment due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**



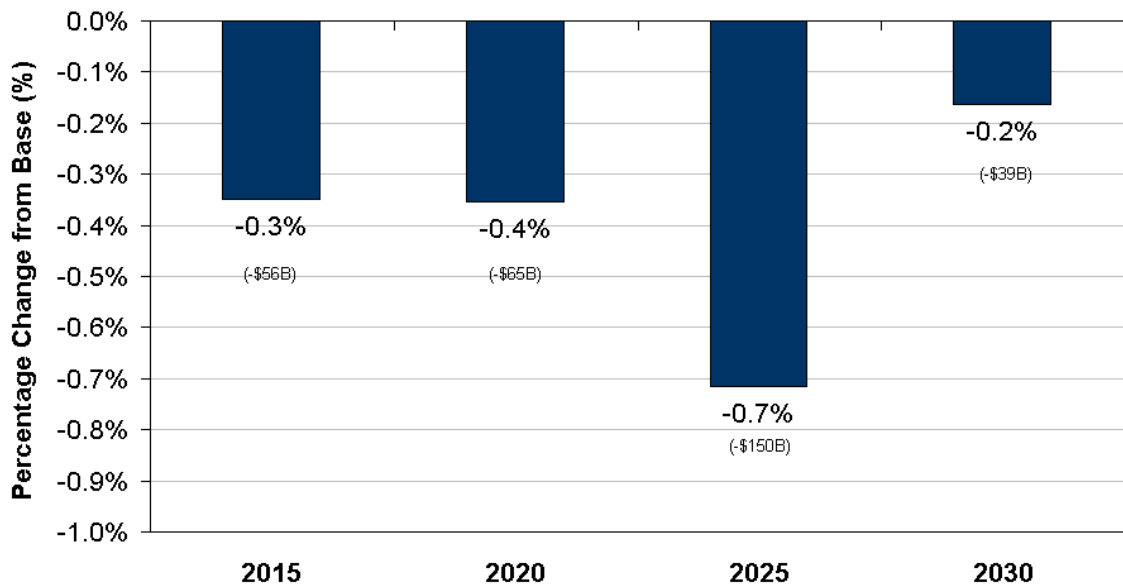
Source: CRA Model Results, 2009

Note: Valued in Billions of \$2008

### 3.1.4 Gross Domestic Product

The estimated impacts on GDP would follow the pattern already evident in the estimated results for consumption and employment. Higher production costs and lower household purchasing power interact. Employment and consumption would tend to fall. Total economic activity, measured as GDP, would also tend to decline. In 2015, the GDP is projected to decline by 0.3% (\$56 billion) below the baseline level, and by the year 2025 it is projected to decline further to 0.7% (\$150 billion) below baseline. In 2030 GDP is estimated to decline by 0.2% (\$39 billion) reflecting the investment needed in order build the infrastructure necessary to comply with future more stringent emission cap. Figure 3.6 illustrates the pattern of estimated GDP losses through time.

**Figure 2.6: Projected Impact on GDP due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**



Source: CRA Model Results, 2009

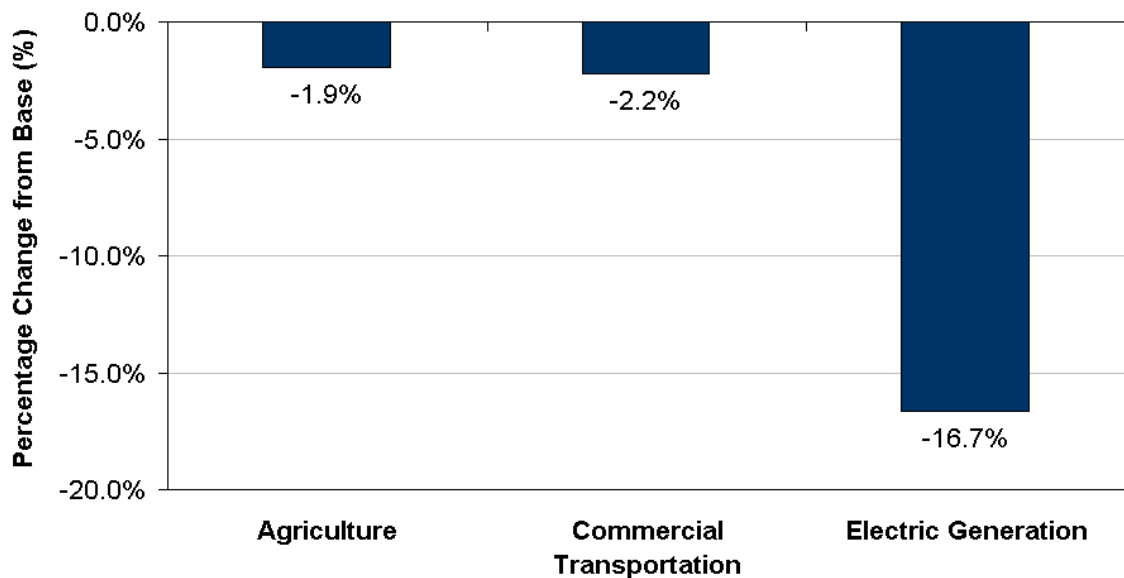
Note: Valued in Billions of \$2008

Although not reported here, as the cap becomes even more stringent after the year 2030 estimated GDP decline is expected to be even more severe reaching 1.3% by the year 2040. As energy supply declines and energy sources become more expensive, economic activity is projected to decline relative to the economy's business-as-usual course.

### 3.1.5 Industry output

As noted above, although the projected declines in economic activity are pervasive, they are also uneven. Some industries would likely experience larger cost increases than others. Figure 3.7 shows the estimated impact on output by industrial sector in 2025.

**Figure 2.7: Projected Impact on Output by Selected Industrial Sector due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**  
Study Case: Year 2025



Source: CRA Model Results, 2009

The projected impacts are most pronounced in the industries directly impacted by higher energy costs. Under the Administration's Budget provisions these sectors would likely be required to use more costly and less available fuels, which are a significant component of their cost structure.

Electric Generation would be directly impacted as the move to more expensive sources of electric power could result in higher electricity prices and lower demand. The Commercial Transportation<sup>5</sup> sector primarily includes activities that are fossil fuel intensive. The estimated value of energy inputs in producing these services are 40 percent of the industry's cost structure. The Agricultural sector<sup>6</sup> is also estimated to be impacted by higher energy

<sup>5</sup> Primarily includes: ground, air, rail, truck, and water transportation

<sup>6</sup> Primarily includes: agricultural production, food production, food processing, food manufacturing and packaging

costs. The higher energy costs are projected to lead to higher domestic production costs for these sectors and could lead to reduced competitiveness vis-à-vis foreign producers.

### 3.2 ENERGY MARKET IMPACTS

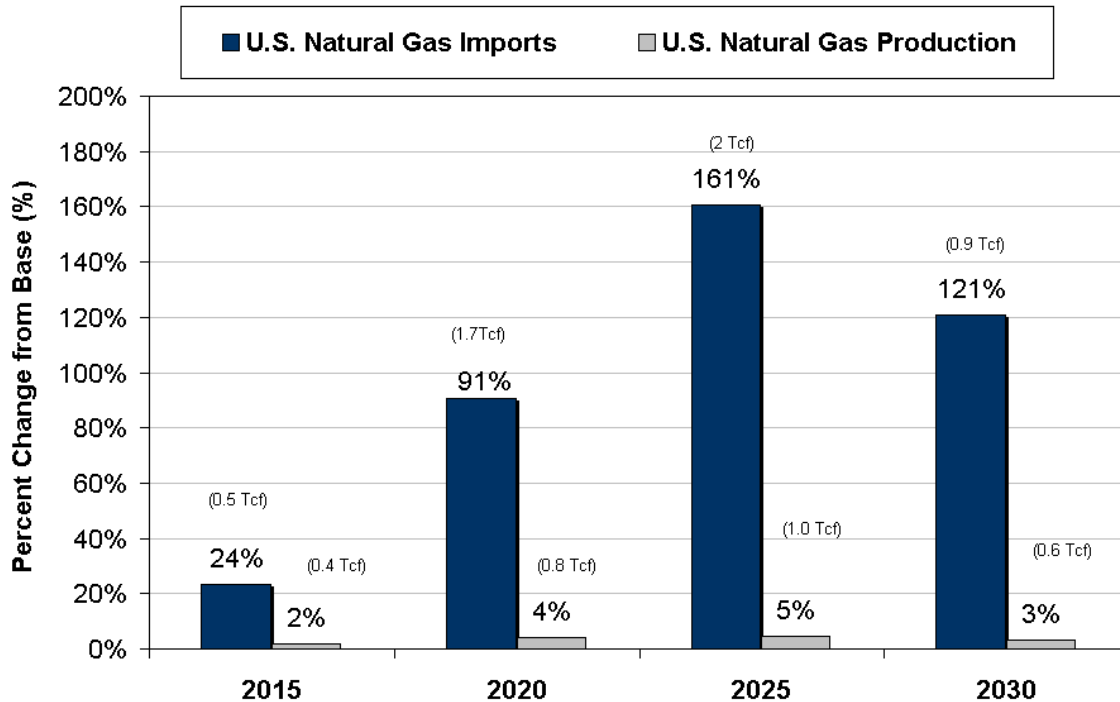
The Cap and Trade climate provision contained in the Obama Administration's FY 2010 Budget Proposal is estimated to raise domestic energy costs. The objective of the Cap and Trade policy is to reduce greenhouse gas emissions by creating a mandated ceiling for these emissions. In so doing, it forces energy producers to either purchase allowances to continue to produce using their current practices or alter their production technologies through added cost in order to reduce their emissions. In either case, the cost of providing energy would increase and a portion of these costs would likely be borne by consumers.

During the early years of the implementation of the cap and trade policy, energy providers are likely to balance the need to supply consumers with energy and reduce their greenhouse gas emissions by relying more on natural gas relative to coal or refined products because natural gas has fewer greenhouse gas emissions per Btu than refined products and almost half that of coal. Figure 3.8 shows the projected increase in the demand for natural gas during the period as well as the projected sources of supply. This figure shows that annual natural gas demand is projected to increase from baseline levels by 0.9 Tcf<sup>7</sup> in 2015 and 3.0 Tcf by the year 2025. However, the allowance costs associated with domestic production of natural gas (allowance costs not imposed on the production of natural gas overseas) would make it less attractive to supply this new demand from domestic sources. As a result, the reliance on supplies of natural gas from foreign sources is projected to grow markedly. Domestic natural gas production is projected to grow from baseline levels by 2.0% (0.4 Tcf) in the year 2015 and by 5.0% (1.0 Tcf) in the year 2025. At the same time imports of natural gas are projected to grow from baseline levels by 24% (0.5 Tcf) in 2015 and 160% (2.0 Tcf) by 2025. After 2025, the emission cap in the cap and trade policy becomes so stringent that it is expected to require a move away from natural gas to other sources of energy, renewables, clean coal, and nuclear. The result is projected lower increases in natural gas demand in the year 2030.

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<sup>7</sup> Trillion cubic feet of natural gas.

**Figure 2.8: Projected Impacts on Natural Gas Supply due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**

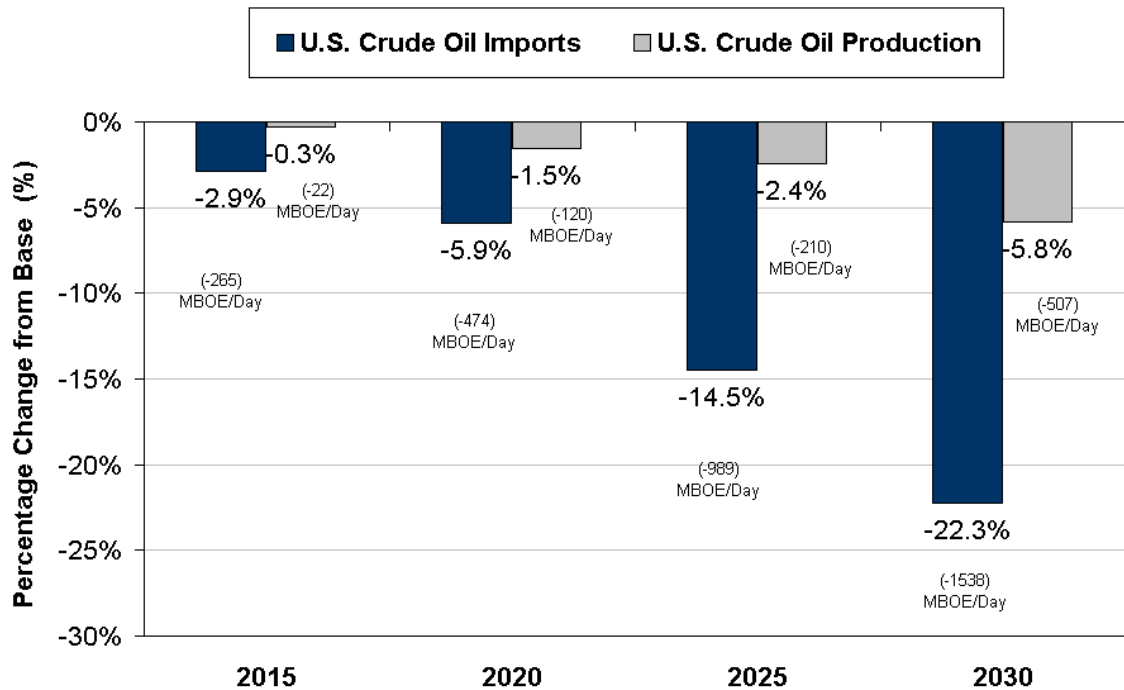


Source: CRA Model Results, 2009

These impacts are conditional upon several assumptions. First, they assume that there are no additional restrictions enacted that would further limit access to domestic natural gas resources. Second, they assume that new LNG terminal capacity can be permitted, constructed and made operational in a timely fashion to receive the additional natural gas imports. Finally, they assume that the U.S. can purchase LNG at or near scenario prices, which is less than what the world market has traditionally supported except in times of excess supplies of natural gas. Any one or more of these assumptions not being realized would be expected to result in greater cost of natural gas to consumers.

The cap and trade policy contained in the Administration's FY 2010 Budget Proposal is likely to increase the costs to find, develop and produce crude oil in the United States. As a result, fewer projects would likely be pursued and domestic production is projected to decline. Figure 3.9 shows that in the year 2015 domestic crude production is estimated to decline by approximately 0.3% (22 MBOE/Day) relative to baseline. This increases to 5.8% (507 MBOE/Day) relative to baseline by the year 2030. During the same period crude imports decline relative to baseline from 2.9% (265 MBOE/Day) in 2015 to 22% (1538 MBOE/Day) in 2030.

**Figure 2.9: Projected Crude Oil Production Impacts due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**

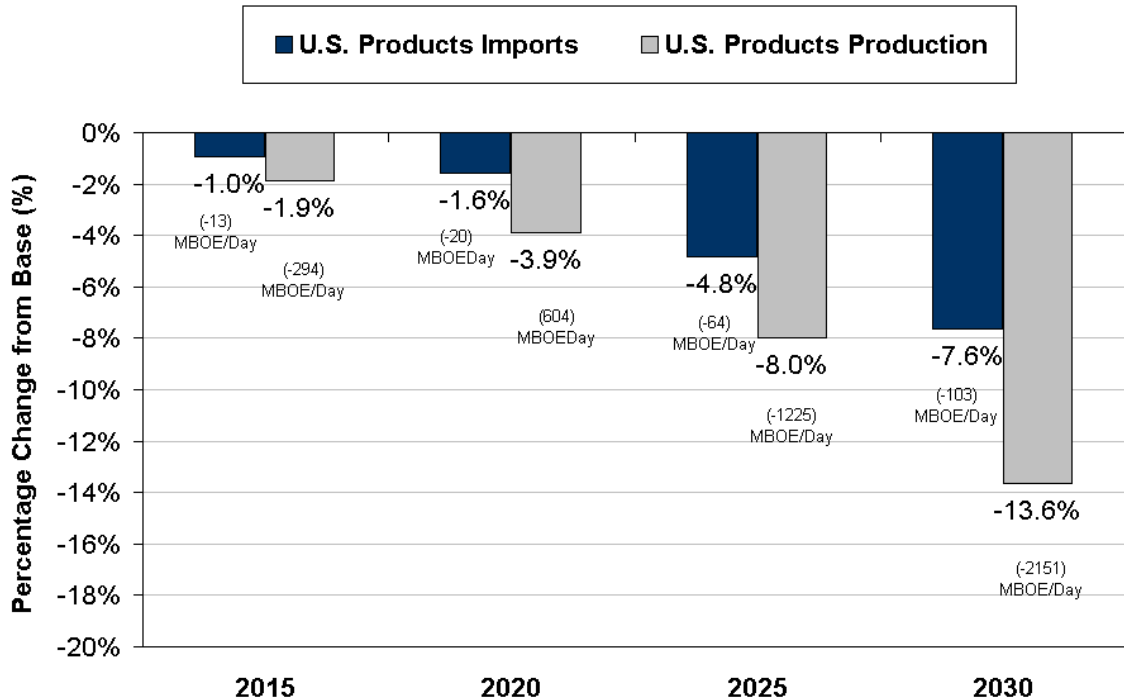


Source: CRA Model Results, 2009

Cap and trade policy contained in the Administration's FY 2010 Budget Proposal would likely adversely impact the ability of U.S. refiners to sustain refinery capacity. While US refineries would be required to purchase allowances for emissions that come directly from their operations, many foreign refineries would not. Overtime, this cost differential could result in an altered pattern of investment in refinery expansions and improvements, with investments potentially shifting from U.S. located refineries to refineries overseas. As a result, there could be a switch from crude oil imports to refined product imports and further loss of jobs in the refining industry.

Based on the projected increase in consumer costs for transportation fuels and heating oil, demand for transportation fuels and heating oil are projected to decline. Figure 3.10 projects that these provisions would result in a 1.9% decline (294 MBOE/day) in domestic production of refined petroleum products by 2015, increasing to 3.9% decline (604 MBOE/day) by 2020, 8.0% decline (1225 MBOE/day) by 2025, and reaching 13.6% decline (2151 MBOE/day) by 2030.

**Figure 2.10: Projected U.S. Refinery Production Impacts due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**

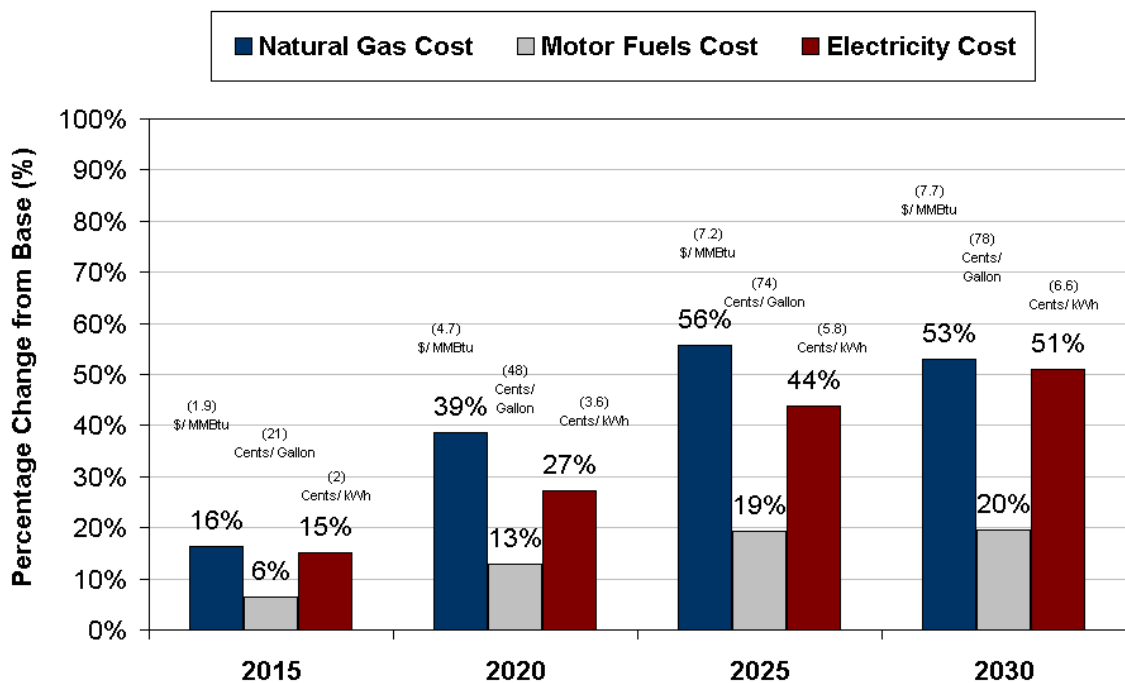


Source: CRA Model Results, 2009

Consumers would likely also bear a portion of added costs projected to result from the Cap and Trade policy. The cap and trade provision is projected to result in fuel switching away from less costly conventional fuels (e.g., coal), towards more costly lower carbon alternatives (including natural gas) due to tightening GHG emission caps. This would increase demand for these lower-carbon fuels, leading to higher costs. Further, costs for all carbon-based energy sources (e.g., coal, oil, natural gas) are projected to increase as allowances would need to be purchased for the emissions associated with the use of these fuels. The model assumes the cost of fuel switching and allowances will be distributed throughout the supply chain.

As shown in Figure 3.11, consumer costs of natural gas, transportation fuels, and electricity all are projected to increase. Natural gas costs are projected to increase above baseline levels by 16% (\$1.90/MMBtu) in 2015, by 39% (\$4.70/MMBtu) in 2020, by 56% (\$7.20/MMBtu) in 2025, and by almost 53% (\$7.70/MMBtu) in 2030. Motor fuels are projected to increase above baseline levels by about 6% (21 cents per gallon) in 2015, by 13% (48 cents per gallon) in 2020, by 19% (74 cents per gallon) in 2025, and 20% (78 cents per gallon) in the year 2030. Electricity costs are projected to increase above baseline levels by 15% (2.0 cents per kWh) in 2015, by 27% (3.6 cents per kWh) in 2020, by 44% (5.8 cents per kWh) in 2025 and 51% (6.6 cents per kWh) by the year 2030.

**Figure 2.11: Projected U.S. Household Costs Impacts for Natural Gas, Motor Fuels and Electricity due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**



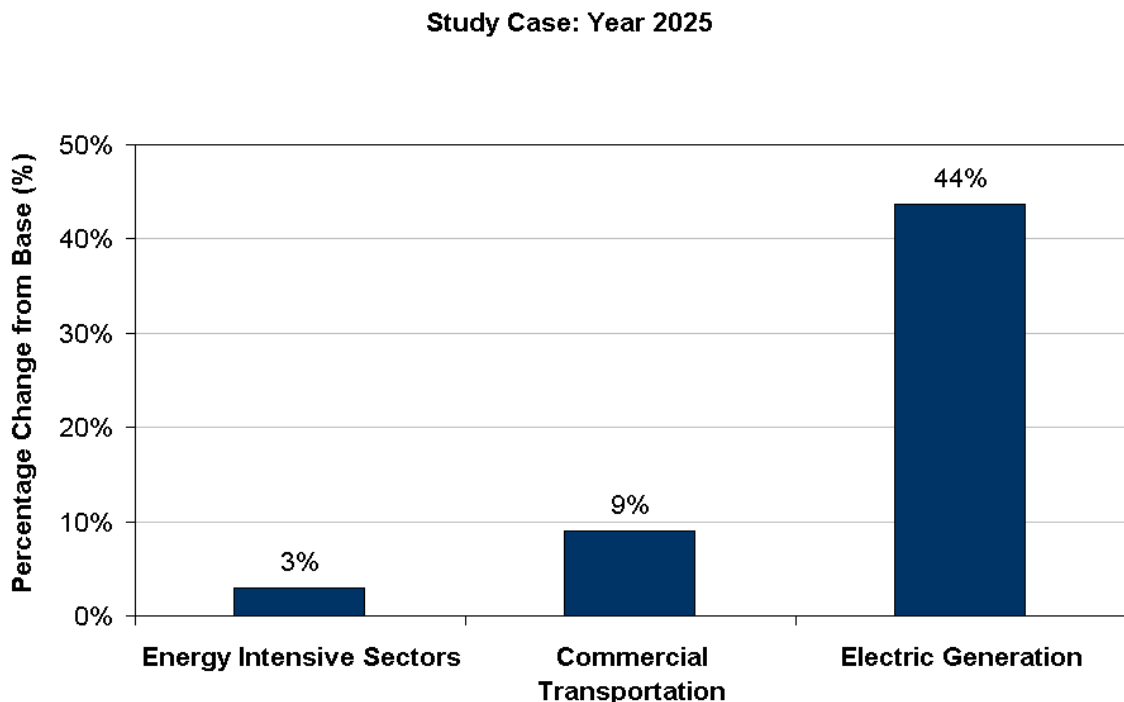
Source: CRA Model Results using publicly available data, 2009

Note: Valued in \$2008

Higher costs estimated to be paid at least in part by end-users would not likely be limited solely to energy. The provisions in the Administration's Budget are estimated to not only increase energy costs, but would likely create a ripple effect throughout the economy as energy is an input to producing goods and services in other sectors of the economy. As a result, end-users are projected to face higher costs for these other goods and services that they consume on a daily basis as shown in Figure 3.12. The costs are estimated to increase over time, as the Cap and Trade policy requires further cuts in greenhouse gas emissions. Examples include:

- Electric generation is estimated to experience the largest increase in cost as energy is a significant component of this sector's operating costs.
- Costs to operate motor vehicles are projected to increase which would also significantly impact the commercial transportation sector. Heating oil costs would also be expected to rise, disproportionately impacting households in the Northeast.
- Finally, energy intensive industries, which would be required either to purchase carbon allowances or modify their production practices, would likely experience higher production costs a portion of which are projected to be borne by consumers.

**Figure 2.12: Projected Impacts on End-User Costs of Selected Goods and Services due to Energy Provisions in the Obama Administration's FY 2010 Budget Proposal**



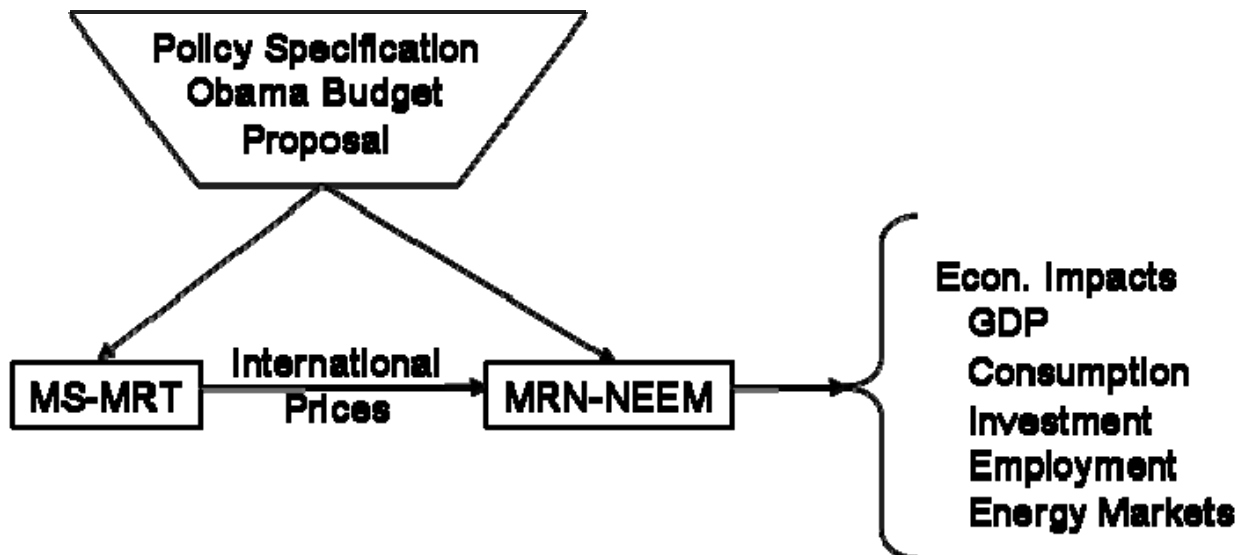
Source: CRA Model Results, 2009

### 3. METHODOLOGY

#### 4.1 MODEL FRAMEWORK

In conducting this analysis for the CAAE, CRA International combined three of its widely accepted state-of-the-art economic models: the Multi-Region, Multi-Sector Trade (MS-MRT) model, the Multi-Region National (MRN) model, and the North American Electricity and Environment Model (NEEM). The linked model approach accounts for the international feedback effects of the U.S. adopting the President's FY 2010 Budget Proposal. As Figure 4-1 illustrates, MS-MRT is used to compute the effect on international prices from the U.S.'s adoption of the President's FY 2010 Budget Proposal. These prices are fed into the MRN-NEEM modeling system, which has a much more detailed representation of the U.S. economy and hence allows for more detailed analysis of the effects of the President's FY 2010 Budget Proposal.

**Figure 3.1: Linkage between MS-MRT and the MRN-NEEM modeling framework**



## 4.2 MODEL DESCRIPTION

This section briefly describes the three models: MS-MRT, MRN, and NEEM. It also provides more information on how the models are linked.

### 4.2.1 Overview of the MS-MRT sub-model

MS-MRT represents the entire world at an extremely aggregated level. It is built upon the GTAP6-IEA database,<sup>8</sup> which includes 83 countries/regions and 23 industries. For this project, we aggregated the dataset into the following regions: USA, Europe, Other OECD, Eastern Europe and Former Soviet Union, Middle East, China and India, high income East Asia, and the rest of the world. To be consistent with the MRN model, the dataset included the following sectors: coal, crude oil, electricity, natural gas, refined petroleum products, agriculture, energy-intensive sectors, manufacturing, services, and commercial transportation.

The model is fully dynamic, which means the agents in the model have perfect foresight and therefore perfectly anticipate all future policies. In other words, there are no surprises in the model, and saving and investment decisions are based on full inter-temporal optimization. MS-MRT belongs to the class of models referred to as general equilibrium.

Conceptually, as a fully dynamic general equilibrium model, the MS-MRT model computes a global equilibrium in which supply and demand are equated simultaneously in all markets for all time periods. The model assumes full employment. There is a representative agent in each region, and goods are indexed by region and time. The incorporated budget constraint implies that there can be no change in any region's net foreign indebtedness over the time horizon of the model. Changes in the prices of internationally traded goods produce changes in the real terms of trade between regions. All markets clear simultaneously, so that agents correctly anticipate all future changes in terms of trade and take them into account in making saving and investment decisions. The model computes, among other variables, investment, industry output, changes in household welfare, gross domestic product, terms of trade, wage impacts, and commodity price changes.

In order to capture some of the short-run costs of adjustment, elasticities of substitution between different fuels and between energy and other goods vary with time. The model is benchmarked to assume baseline rates of economic growth based on official government statistics and a common rate of return on capital in all countries. The rate of growth in the

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<sup>8</sup> Dimaranan, Betina V., "The GTAP 6 Data Base: (Global Trade, Assistance, and Production)." Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University, December 2006.

effective labor force (population growth plus factor-augmenting technical progress) and the consumption discount rate are calibrated to be consistent both with the assumed rates of growth and return on capital, and with zero capital flows between regions on the balanced growth path.

The President's FY 2010 Budget Proposal was analyzed under the assumption that the U.S. economy would evolve in accordance with the Energy Information Agency's 2009 Annual Energy Outlook's reference case. These forecasts provide the baseline growth rate, energy consumption, energy production, and energy prices to which the model is benchmarked. The macro economic sub-model MS-MRT is benchmarked to the same economic forecast used in the MRN sub-model to maintain consistency between the models.

MS-MRT includes the markets for three fossil fuels and their products. Electricity and all other non-energy sectors (e.g., agriculture) are produced using these fuels, capital, labor, electricity, and materials as inputs. The model allows for complete bilateral trade in all goods produced by all industries.<sup>9</sup> The MS-MRT model uses an Armington structure in its representation of international trade in all goods except crude oil, which is treated as a homogeneous good perfectly substitutable across regions. The Armington structure assumes that domestically produced goods and imports from every other region are differentiated products. Domestic goods and imports are combined into Armington aggregates, which then function as inputs into production or consumption.

Because crude oil is treated as a homogeneous good, it trades internationally under a single world price. Conversely, representing natural gas and coal as Armington goods allows the model to approximate the effects of infrastructure requirements and high transportation costs between some regions. World supply and demand determine the world price of fossil fuels in the model. Current taxes and subsidies are included in each country's prices.

MRN-NEEM accounts for the added costs to US refiners of the requirement that US refineries hold allowances to cover their direct GHG emissions. This creates a competitive disadvantage relative to foreign refineries in countries not subject to emission limits under the Kyoto Protocol. Since refined product imports are treated as Armington goods in the CRA model that cost disadvantage does not lead to wholesale shutdown of US refineries. If it were possible to obtain refined product imports meeting US standards at a constant price lower than the cost of continued operation of US refineries, there could be a larger switch from crude oil imports to refined product imports and further loss of jobs in the refining industry.

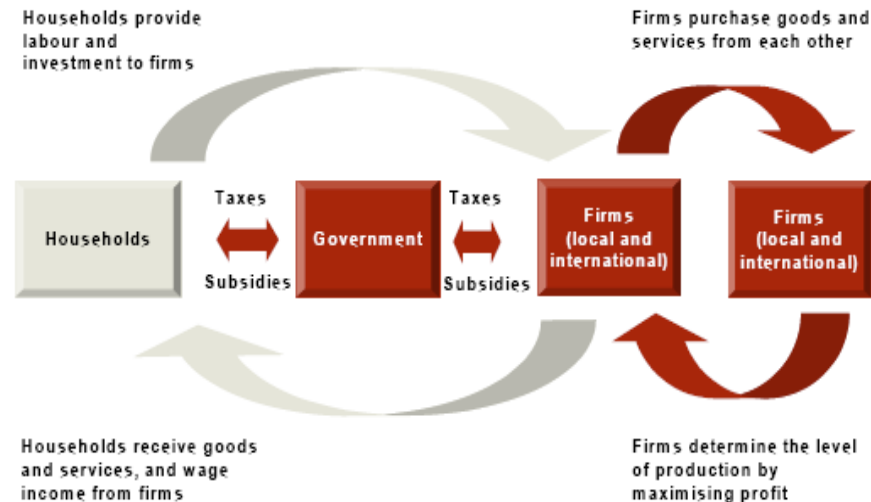
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<sup>9</sup> Where the data show no trade in a particular good occurs between two regions, such as electricity between Europe and the US, the model ensures that no trade can occur in the future.

#### 4.2.2 Overview of the MRN sub-model

The top-down component of the integrated MRN-NEEM model is tailored from CRA International's Multi-Region National (MRN) model, which is similar to MS-MRT in structure. MRN is a forward-looking, dynamic computable general equilibrium (CGE) model of the United States. It is based on the theoretical concept of an equilibrium in which macro-level outcomes (e.g., consumption and investment) are driven by the decisions of self-interested consumers and producers. The basic structure of CGE models, such as MRN, is built around a circular flow of goods and payments between households, firms, and the government, as illustrated in Figure 4-2.

**Figure 3.2: Circular Flow of Goods and Services and Payment Figure**



#### 4.2.3 Overview of the NEEM sub-model

The North American Electricity and Environment Model (NEEM) fills the need for a flexible, partial equilibrium model of the North American electricity market that can simultaneously model both system expansion and environmental compliance over a 50-year time frame.

The model employs detailed unit-level information on all of the generating units in the United States and large portions of Canada. In general, coal units over 100 MW are represented individually in the model, and other unit types are aggregated. NEEM models the evolution of the North American power system, taking account of demand growth, available generation, environmental technologies, and environmental regulations both present and future. The North American interconnected power system is modeled as a set of regions that are connected by a network of transmission paths.

### 4.3 INTEGRATION METHODOLOGY

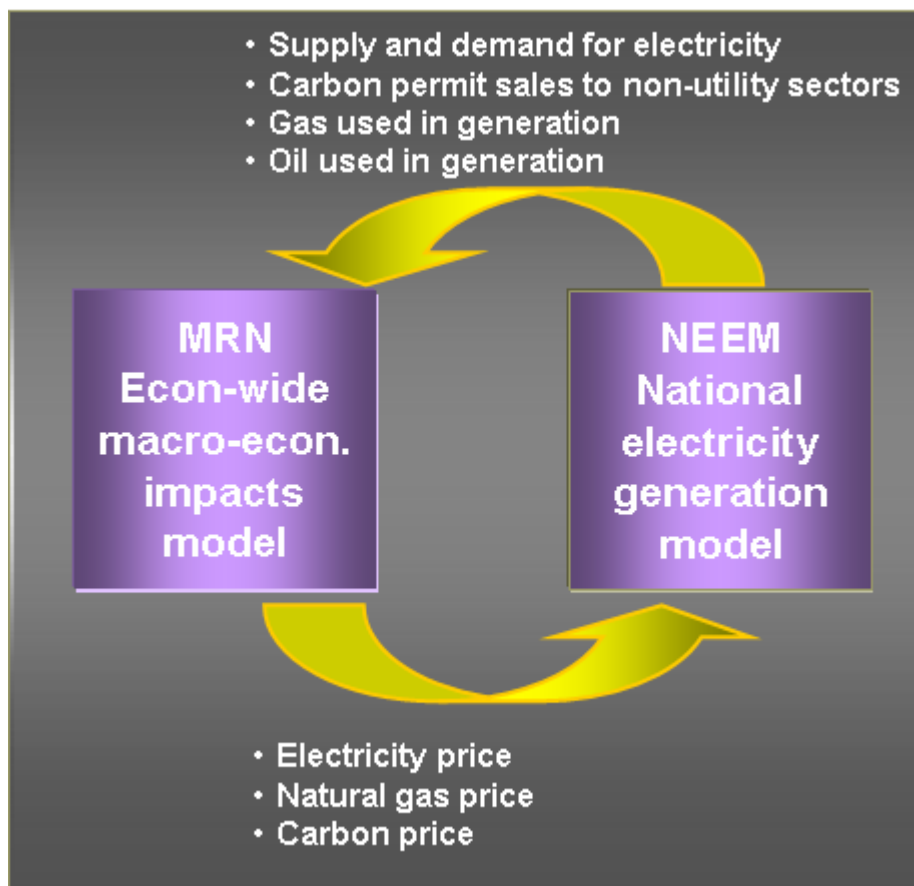
#### 4.3.1 Linking MS-MRT and MRN-NEEM

There is a one-way link between the MS-MRT and MRN-NEEM models. The change in international prices from the U.S. adopting President's FY 2010 Budget Proposal becomes an input to MRN-NEEM. This model represents the U.S. and assumes perfectly elastic supply and demand curves for imports and exports. The prices for these curves are determined by MS-MRT.

#### 4.3.2 Linking MRN and NEEM

The MRN-NEEM integration methodology links the top-down and bottom-up models. The linking method utilizes an iterative process where the MRN and NEEM models are solved in succession, reconciling the equilibrium prices and quantities between the two. The solution procedure, in general, involves an iterative solution of the top-down general equilibrium model given the net supplies from the bottom-up energy sector sub-model followed by the solution of the energy sector model based on a locally calibrated set of linear demand functions for the energy sector outputs. The two models are solved independently using different solution techniques but linked through iterative solution points (see Figure 4-3).

**Figure 3.3: MRN-NEEM Iterative Process**



## 4.4 STUDY CASE DESCRIPTION

### 4.4.1 Baseline

This analysis measures the effect of the climate provision in the Administration's FY 2010 Budget Proposal by comparing them to a base case. The base case is constructed to conform to the projections of the 2009 Annual Energy Outlook (AEO) produced by the Energy Information Administration (EIA) of the US Department of Energy. Specifically, the analysis is based on the AEO 2009 Early Release.<sup>10</sup> This release does not yet provide details of EIA's assumptions about natural gas resources. To sustain the natural gas prices projected by EIA through 2020, it would be necessary to restrict access (or assume lower availability than industry sources now estimate) of unconventional natural gas resources. This leads directly to the conclusions in this report that the proposed climate provisions that increase producers cost and likely lead to reduced domestic supply, and increased natural gas demand lead to increased imports rather than domestic production.

## 4.5 KEY ASSUMPTIONS

### 4.5.2 A Cap and Trade Policy for Greenhouse Gases

The Obama Administration's FY 2010 Budget Proposal calls for imposition of an economy-wide Cap-and-Trade policy for greenhouse gases (GHGs). A Cap-and-Trade policy sets a total limit on emissions of greenhouse gases. To legally emit GHGs that are subject to such a cap, a source must submit to the government a permit for each ton that it emits. In any given year, government auctions only the number of greenhouse gas emission permits that equals the number set by the cap. Once government has auctioned emission permits to other entities, the permits can be freely bought and sold.

In the case of the Obama Administration's FY 2010 Budget Proposal, the GHG cap would begin to apply in 2012. At its onset, it would limit emissions to the level that had prevailed in 2005. By 2020, the cap on emissions would fall to 14% below the 2005 level and by 2050, the cap on emissions would fall even further to 83% below the 2005 level. The Obama Administration's FY 2010 Budget Proposal's cap-and-trade provisions do not appear to envision either offsets or banking; therefore, in modeling the Obama Administration's FY 2010 Budget Proposal's impacts, CRA did not include such provisions.

Estimating the abatement costs that could be needed to reach these deep cuts in emissions presents a series of challenges. CRA has performed analyses of other GHG control plans. These plans embodied emission caps and schedules that resemble those contained in the

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<sup>10</sup> Energy Information Administration, "Annual Energy Outlook 2009 Early Release with Projections to 2030", prepared by the U.S. Department of Energy, January 2009.

Obama Administration's FY 2010 Budget Proposal. These studies revealed permit auction revenues, and, by inference, abatement costs, that were well above those being discussed in the Obama Administration's FY 2010 Budget Proposal.

Thus, CRA's modeling analysis suggests that there is an apparent conflict between the Obama Administration's FY 2010 Budget Proposal's GHG reduction goals and its revenue estimates. Implicitly that conflict also extends to the cap-and-trade plan's impacts on the energy sector and the larger US economy. The modeling results imply higher marginal abatement costs than those assumed by the Administration. These higher abatement costs, in turn, imply a larger impact on economic activity, consumption, and growth.

Facing a choice between GHG targets that conflict with the Obama Administration's FY 2010 Budget Proposal's revenue estimates, CRA based its analysis on the former rather than on the latter. It used the CRA model to estimate the effects of reaching the GHG caps specified in the Obama Administration's FY 2010 Budget Proposal. This approach will inevitably yield results involving both a larger economic impact and a larger fiscal windfall to the federal government than that described in the Obama Administration's FY 2010 Budget Proposal. The CRA analysis encompasses both the Obama Administration's FY 2010 Budget Proposal's direct impacts on production and consumption and its indirect impacts through increased government revenue and spending.

The Obama Administration's FY 2010 Budget Proposal makes clear that government would auction all the GHG permits that it proposes to create. That is to say that none of the allowances would be given away to firms that may be exposed to abatement cost increases. The revenues from these auctions would be large – even using the Administration's probably understated revenue estimates. By 2019, according to the Obama Administration's FY 2010 Budget Proposal, annual auction revenues would be approximately \$83 billion.

The Obama Administration's FY 2010 Budget Proposal envisions three uses for this influx of revenue.

First, the permit auction revenue would be used to offset the fiscal losses stemming from the proposed "Making Work Pay" provision. The "Making Work Pay" provision would amount to a reduction in tax rates on labor of 6.8% for families with labor income up to \$11,800. The deductions would be half that for single workers. It would then phase down to a zero reduction at \$75,000. Statistics on income distribution allow CRA to calculate the effects of "Making Work Pay". Using these statistics, it is possible to estimate the average effect on tax rates. In doing this analysis CRA assumed that the provision could be indexed to inflation. Hence, in real dollar terms the provision's impact is little over time.

The second use would be to provide \$15 billion annually to subsidize "clean energy". CRA modeled this provision by assuming a lump sum transfer to households. The Obama Administration's FY 2010 Budget Proposal is very unclear about the uses to which these funds would be put. However, the cap-and-trade program would likely create strong market

incentives for development and commercialization of greenhouse gas-lowering technologies. In this environment, a relatively small increment of government spending on these projects is likely merely to crowd out financing that the private sector would already be likely to provide. The added spending would, therefore, be unlikely to much affect the future path of technology although it could confer windfalls on some firms or individuals. A lump sum distribution is the most accurate way to represent the effect of this fiscal substitution or payment for projects that would have been undertaken without the added financing.

Third, the Administration's Budget Proposal envisions that some additional auction revenues could be returned to households, but it provides no explanation as to how this distribution should occur. Lacking these details, the CRA analysis distributed as equal lump sum payments the auction revenues over and above those that the Obama Administration's FY 2010 Budget Proposal set-aside for Clean Energy and "Making Work Pay".

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