THE THOMAS JEFFERSON INSTITUTE FOR PUBLIC POLICY

Economic Impact on Virginia from Proposed Cap and Trade Legislation

Two Recent Economic Analyses Re-released by:

Thomas Jefferson Institute for Public Policy

and the

Virginia Manufacturers Association

Economic Impact Analysis by:

The Heritage Foundation
The Beacon Hill Institute

August 2009

Thomas Jefferson Institute for Public Policy

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Foreword

As the country is immersed in the gigantic health care debate, there remain other important issues facing our economy. One of these is the pending "Cap and Trade" legislation pending in Congress known as the Waxman-Markey bill.

Climate Change is a big issue and new scientific facts are surfacing regularly to challenge the cause of climate change and even if the earth is actually warming. But that is an argument for another day.

The "Cap and Trade" legislation that passed the House of Representatives needs to be analyzed from an economic impact point of view and that is exactly what the Thomas Jefferson Institute and the Virginia Manufacturers Association wanted to do. We have re-printed herein two important economic analyses of the current "Cap and Trade" legislation – the Waxman-Markey Bill. One was completed by The Heritage Foundation of Washington DC (Heritage) and released on August 19, 2009 and one by the Beacon Hill Institute (BHI) released in June of this year. William Beach, the Director of Heritage's Center for Data Analysis is a member of the Board of Directors of the Thomas Jefferson Institute. The BHI is same high-powered group of economists that built the effective tax-and-spend economic model for the Jefferson Institute (Virginia STAMP) that was praised in the past by Republicans and Democrats.

These analyses show the huge impact that the proposed Cap and Trade legislation will have on our economy. It is the hope of the Thomas Jefferson Institute and the Virginia Manufacturers Association that this economic impact will be considered by our congressional delegation as it ponders what to do concerning this legislation.

According these analyses the proposed carbon tax will cost the residents of Virginia greatly over the next decades.

The Beacon Hill Institute analysis shows the carbon tax will cost Virginia more than $3 billion in 2020 and over $25 billion by 2050. This increased cost of energy will result in more than 65,000 jobs being lost by 2020 and more than 780,000 jobs by 2050 – a huge number of jobs in our state, real disposable income will decrease by close to $7 billion by 2020 and more than $17 billion by 2050, annual investment in our state will decrease by $911 million by 2020 and by close to $8 billion by 2050, and state and local governments would lose more than $1 billion in taxes by 2020 and more than $9 billion by 2050 in constant dollars. This impact would cause all sorts of problems to our economy as we strive to compete on a national and international level.

In the Heritage economic analysis the "Cap and Trade" legislation as passed by the House of Representatives will, on the average between the years 2012 & 2035, lower the state's gross state product by over $8 billion, reduce personal income by over $3 billion, eliminate over 26,000 jobs, raise electricity price more than $500 per household and gasoline prices by 64 cents per gallon.

It is our hope that those involved in crafting and influencing public policy will look at this report and take its finding into careful consideration as national legislation is crafted to confront climate change. Economic growth and prosperity is the key to human advancement. There are ways other than the proposed "Cap and Trade" legislation that can be considered to allow both vibrant economic growth and protection from undue climate change. Indeed, many argue that the way to a more environmentally friendly world is to encourage true environmental stewardship and that means economic development in a way that improves our environment and maintains a strong incentive for economic growth. We have proven this can be accomplished here in the United States since our air and water are dramatically cleaner than was the case at the first national "Earth Day" over 40 years ago.

These two economic analyses are a caution to our elected leaders and others that whatever Climate Change/Cap and Trade legislation is ultimately crafted, it needs to be carefully reviewed and analyzed so that our quality of life and economic growth are not adversely impacted.

These two economic analyses are provided as a public service and is not meant to support or defeat any specific piece of legislation. We do hope that it adds to the public discussion surrounding is this important issue of "Cap and Trade."

Michael W. Thompson   Brett   Vassey
Chairman and President   President and CEO
Thomas Jefferson Institute for Public Policy   Virginia Manufacturers Association

August 2009

Thomas Jefferson Institute for Public Policy

Impact of the Waxman–Markey Climate Change Legislation on Virginia

David W. Kreutzer, Ph.D., Karen A. Campbell, Ph.D., William W. Beach, Ben Lieberman, and Nicolas D. Loris

On June 26, a 1,427-page climate change bill introduced by Representatives Henry Waxman (D–CA) and Edward Markey (D–MA) passed the House by a narrow margin. The bill, also known as Waxman–Markey, includes a number of alarming provisions, chief among them a cap-and-trade program that would attempt to curb global warming by imposing strict upper limits on the emission of six greenhouse gases, with the primary emphasis on carbon dioxide (CO_2). The mechanism for capping these emissions requires emitters to acquire federally created permits (or "allowances") for each ton of greenhouse gas emitted.

Because these allowances carry a price—and because 85 percent of the United States' energy needs come from carbon-emitting fossil fuels—Waxman–Markey is best described as a significant tax on energy use. Since everything Americans use and produce requires energy, the tax hits U.S. pocketbooks again and again. The Heritage Foundation's Center for Data Analysis forecasts severe consequences, including skyrocketing energy costs, millions of jobs lost, and falling household income and economic activity—all for negligible changes in the global temperature.[1]

Workers and families in Virginia may be wondering how cap-and-trade legislation would affect their income, their jobs, and the cost of energy. Implementing Waxman–Markey would put a chokehold on Virginia's economic potential, reducing gross state product by $14.75 billion in 2035.

The Waxman–Markey Effect

For the state of Virginia, over the 2012–2035 timeframe, on average the Waxman–Markey bill would:

- Lower gross state product by **$8,762 million**,
- Reduce personal income by **$3,247 million**,
- Destroy **26,604 jobs**,
- Raise electricity prices by **$532.18 per household**,
- Raise gasoline prices by **$0.64 per gallon**.

Source: Heritage Foundation calculations based on the IHS/Global Insight U.S. Macroeconomic and Energy models.

Table 1 • WM 2585-VA ☎ heritage.org

Consumers would be hit hard. Between 2012 (when the restrictions first apply) and 2035 (the last year of this analysis), the prices of electricity and gasoline will rise sharply when compared to prices in a world without cap and trade. By 2035, Americans living in the state of Virginia will see their electricity prices rise by $1,031.73 and their gasoline prices rise by $1.31 per gallon solely because of Waxman–Markey.

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Economic Indicators in Virginia

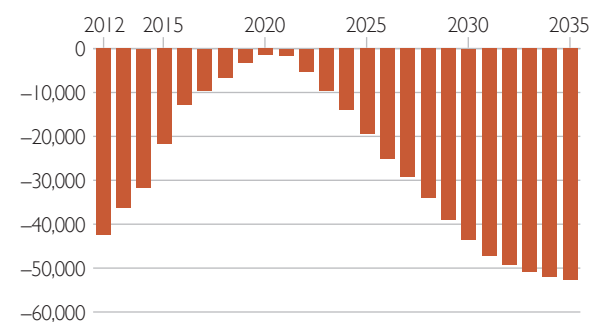Changes in Virginia's economy due to the Waxman–Markey climate change bill. Figures are adjusted for inflation.

Change in Gross State Product

In Millions of Dollars
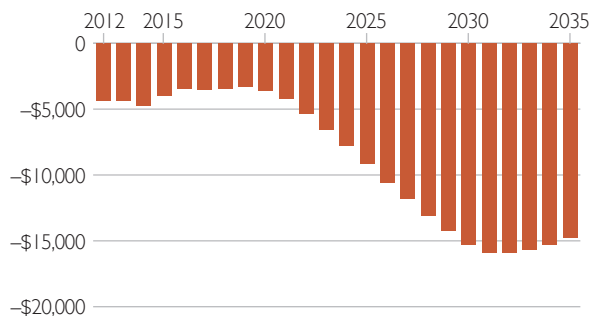
Change in Non-Farm Employment

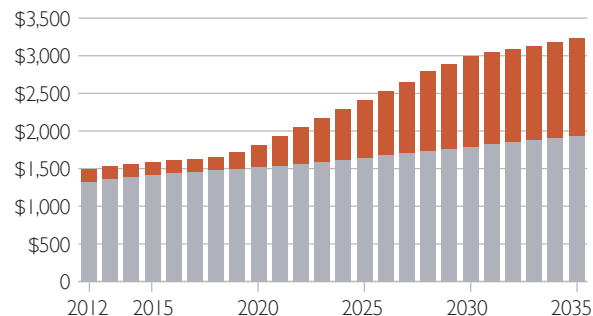**Source:** Heritage Foundation calculations using the IHS/Global Insight U.S. Macroeconomic model.

Chart 1 • WM 2585-VA ☎ heritage.org

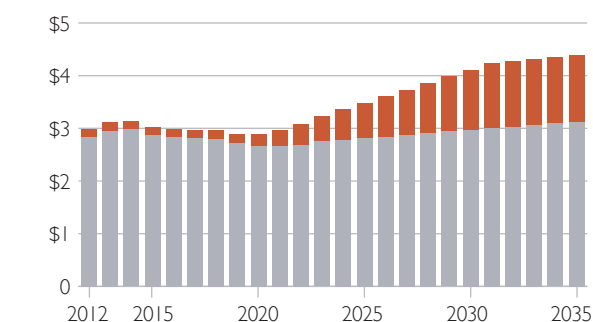## Utility Costs in Virginia

Costs for electricity and gasoline in Virginia with and without the Waxman–Markey climate change bill. Figures are adjusted for inflation.

■ *Extra costs due to Waxman–Markey bill*   ■ *Without bill*

Average Annual Household Electricity Cost

Cost of a Gallon of Gasoline

Source: Heritage Foundation calculations using the IHS/Global Insight U.S. Macroeconomic model.

Chart 2 • WM 2585-VA ☎ heritage.org

As the economy adjusts to shrinking gross domestic product (GDP) and rising energy prices, employment will take a big hit in Virginia. Beginning in 2012, job losses will be 42,413 higher than without a cap-and-trade bill in place. And the number of jobs lost will only go up, increasing to 52,693 by 2035.

Contrary to the claims of an economic boost from green investment and green job creation and "postage stamp" costs, the Waxman–Markey climate change legislation does the complete opposite by increasing energy prices—thereby causing a considerable reduction in the rate of economic growth, the amount of GDP, household incomes, and employment.

—David W. Kreutzer, Ph.D., is Senior Policy Analyst for Energy Economics and Climate Change, Karen A. Campbell, Ph.D., is Policy Analyst in Macroeconomics, William W. Beach is Director of the Center for Data Analysis, Ben Lieberman is Senior Policy Analyst in Energy and the Environment, and Nicolas D. Loris is a Research Assistant in the Thomas A. Roe Institute for Economic Policy Studies at The Heritage Foundation.

1. Chip Knappenberger, "Climate Impacts of Waxman–Markey (the IPCC-Based Arithmetic of No Gain)," MasterResource, May 6, 2009, at *http://masterresource.org/?p=2355* (August 3, 2009).

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The Economic Effects of Proposed Cap-and-Trade Legislation on the State of Virginia

President Obama and several members of Congress have proposed legislation to reduce greenhouse gas (GHG) emissions in the United States. The Waxman-Markey Bill currently before Congress would bring GHG emissions, and hence carbon emissions, below 2005 levels in steps – 3% below those levels by 2012, 20% by 2020, 42% by 2030, and 83% by 2050.

Waxman-Markey would create a "cap-and-trade" system, under which U.S. producers would receive tradable permits to emit greenhouse gasses. Producers buying the permits would, in effect, pay a tax for the privilege of emitting greenhouse gasses currently emitted without charge. The resulting "carbon tax" would have an effect on production and employment similar to an explicit excise tax on production.

In this report, the Beacon Hill Institute (BHI) uses two computer modeling capabilities to estimate the economic effects of this tax on the Virginia economy. The first of these is the "DICE" (Dynamic Integrated Model of Climate and Economy) model developed by William Nordhaus of Yale University.[1] The second is the Beacon Hill Institute STAMP® (State Tax Analysis Modeling Program). We used the DICE model to estimate the implicit carbon tax that Waxman-Markey would impose on U.S. producers and the STAMP model to estimate the resulting effects on the Virginia economy.[2] Table 1 displays the results.

Table 1: The Economic Impact of Waxman-Markey on Virginia (2009 $)

Cost of Carbon	2020	2050
Equivalent Carbon Tax (current $/metric ton)	92.66	714.00
Total net cost to Virginia (billions $)	3.01	25.76
Economic Variables		
Total Employment (Jobs)	-65,332	-784,591
Gross Wage Rate ($/person/year)	-627.48	-5,370.63
Investment ($ millions)	-911.22	-7,799.15
Real Disposable Income ($ millions)	-6,873.53	-17,271.16
Tax Revenues		
State Funds ($ millions)	-631.61	-5,406.02
Local Funds ($ millions)	-472.71	-4,045.97
Total Funds ($ millions)	-1,104.32	-9,451.99

We find that the cap-and-trade system would impose a tax of $92.66 per metric ton of carbon in 2020 in order to reach the 20% emissions reduction goal. The cost of carbon would rise to $714 in 2050 to

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[1] William Nordhaus, 2008, *A Question of Balance*, Yale University Press.
[2] For a description about the model see www.beaconhill.org.

reduce emissions by 83% below 2005 levels. These carbon taxes would cost the residents of Virginia $3.01 billion dollars in 2020 and $25.76 billion by 2050 through increased energy prices.

These increased energy prices would inflict significant harm on the Virginia economy. The state economy would shed 65,332 jobs by 2020 and 784,591 by 2050. The decrease in labor demand, as seen in the job losses would cause gross wages per person to fall by $627 per capita annually by 2020 and $5,371 by 2050.

The job losses and price increases would combine to reduce real incomes as firms, households and governments spend more of their budgets on energy and less on other items, such as home goods, entertainment and clothing. As a result, real disposable income would fall by $6.874 billion per year by 2020 and $17.271 billion by 2050. Furthermore, annual investment in the state would fall by $911 million by 2020 and $7.799 billion by 2050.

State and local government tax collections would also suffer from the economic damage. By 2020, the state of Virginia can expect annual tax revenues to fall by $631.61 million, while local governments would lose $472.71 million in tax revenue, for a combined state and local revenue loss of $1.104 billion. By 2050, the state and local government tax revenue losses would swell to over $9.40 billion, with the state losing $5.406 billion and local governments losing $4.046 billion.

Table 2: Effects of Waxman-Markey on Energy Prices in Virginia

Energy Source	2008 Retail Price	Energy Price Increases	
		2020	2050
Gasoline retail price ($/gal)	2.76	0.29	1.94
Natural gas residential price ($/'000 cu ft)	16.20	1.75	10.66
Electricity retail price : natural gas (¢/kWh)	7.16	1.11	7.64
Electricity retail price : coal (¢/kWh)	7.16	2.48	16.93
Coal, bituminous, market price ($/ton)	40.8*	40.63	277.89
Coal, lignite, market price ($/ton)	14.89*	71.69	490.29

*2007 national price

Table 2 shows how cap-and-trade would affect energy prices in Virginia. The policy would push up the price of gasoline by 29 cents/gallon by 2020 and by $1.94/gallon by 2050, and would raise the retail price of electricity produced from natural gas by 1.11 cents/kWh by 2020 and 7.64 cents/kWh by 2050. Electricity produced from coal would experience a 2.48 cent/kWh increase by 2020 and a 16.93 cent/kWh increase by 2050. Additionally, bituminous coal would increase in cost by $40.63 /ton by 2020 and $277.89 /ton by 2050, while lignite coal would increase by $71.69 /ton by 2020 and $490.29 /ton by 2050.

Conclusion

Cap-and-trade is aimed at reducing the consumption of fossil fuels by increasing their prices and thus, in turn, the prices of energy and of all goods and services. A cap-and-trade proposal such as Waxman-Markey would therefore inflict large negative impacts on the economy of Virginia. The state would experience significant declines in employment, wages, disposable income and investment upon implementation of the policy.

There is, moreover, no offsetting benefit to the other states that would offset the harm suffered by Virginia. In other analyses, we have shown that Waxman-Markey would inflict harm on the U.S. economy as a whole equivalent to what it would inflict just on the state of Virginia.[3] No proposal to institute cap-and-trade should go forward without regard to these findings.

Methodology

To reduce GHG emissions, a cap-and-trade system seeks to change the behavior of economic agents such as producers, consumers and governments. It does so by changing the incentives, both negative and positive, faced by all three when consuming GHG producing energy.

BHI deployed the DICE model developed by William Nordhaus of Yale University to estimate the carbon tax needed to achieve the GHG reduction mandated by Waxman-Markey. We then used these results to calculate the effects on fossil fuel prices that would result from reducing GHG emissions and to measure the effects on the economy of Virginia. Although full details of the DICE model are set out clearly in Nordhaus (2008), and the computer code is freely available, it is useful to sketch the essential components here.

The model consists of 19 dynamic equations and rests on 44 non-trivial parameters. The objective is to maximize the present value of the utility that consumers get over time from consumption. Emissions of CO2 accumulate in the atmosphere and the oceans, and these accumulations reduce output via a damage function. Spending on emissions abatement is costly, and so there is a tradeoff: more abatement eats into consumption directly but limits damage by avoiding further warming that would indirectly have cut consumption. In principle there is a level and time pattern of emissions reductions that maximize utility, which is referred to as the optimal path. This may be compared to the "baseline" case of no emissions controls for 250 years.

The model allows one to specify abatement targets – for example, a maximum allowable rise in global temperature, or a maximum atmospheric concentration of CO2, or a given proportionate reduction in

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[3] We will provide the results on request.

emissions. The model then determines how much to save and invest, and how much to spend on abatement. It also generates the carbon taxes that would be needed to yield these outcomes efficiently. We used the results of the DICE model to calculate the changes in fossil fuel prices that would result from reducing GHG emissions and to measure the effects on the economy of Virginia.

The cap-and-trade policy would increase the price of energy, and subsequently goods and services. Standard economic theory shows that price increases of a good or service leads to a decrease in overall consumption, and consequently a decrease in the production of that good or service. This is especially true in periods of economic decline as we are now facing. As producer output falls, the decrease in production results in a lower demand for labor. We assume that the federal government opts for the free permit model under its cap-and-trade program and thus foregoing a substantial amount of revenue.

BHI utilized its STAMP (State Tax Analysis Modeling Program) model to identify the economic effects and understand how they operate through a state's economy. STAMP is a five-year dynamic CGE (computable general equilibrium) model that has been programmed to simulate changes in taxes, costs (general and sector-specific) and other economic inputs. As such, it provides a mathematical description of the economic relationships among producers, households, governments and the rest of the world. It is general in the sense that it takes all the important markets, such as the capital and labor markets, and flows into account. It is an equilibrium model because it assumes that demand equals supply in every market (goods and services, labor and capital). This equilibrium is achieved by allowing prices to adjust within the model. It is computable because it can be used to generate numeric solutions to concrete policy and tax changes.[4]

BHI calculated the impact of the fossil fuel price increases on the price level for each of the (27) sectors of the economy within the STAMP model. Using the Energy Information Agency's (EIA) national data on GHG emissions by the residential, commercial, industrial and transportation sectors; we allocated the national emissions to the STAMP sectors.[5] We then used data from the U.S. Census Bureau's Economic Census as a proxy for the size of each industry in each state relative to the national data.[6] We applied the cost of carbon, adjusted to be equivalent to 3.67 metric tons of CO_2, to GHG emissions

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[4] For a clear introduction to CGE tax models, see John B. Shoven and John Whalley, "Applied General-Equilibrium Models of Taxation and International Trade: An Introduction and Survey," Journal of Economic Literature 22 (September, 1984): 1008. Shoven and Whalley have also written a useful book on the practice of CGE modeling entitled Applying General Equilibrium (Cambridge: Cambridge University Press, 1992).

[5] U.S. Department of Energy, Energy Information Agency, American Energy Outlook 2009, Table 18: Carbon Dioxide Emissions by Sector and Source, Internet, available at www.eia.doe.gov/oiaf/servicerpt/stimulus/excel/aeostimtab_**18**.xls.

[6] 2002 Economic Census, Summary Statistics by 2002 NAICS, United States, Internet, available at http://www.census.gov/econ/census02/data/us/US000.HTM.

in each sector, which gives us our total cost to the economy. We converted these price increases in dollars into percentage changes based on the annual value of production in each sector.

We simulated these changes in the STAMP model as a percentage price increase on fuel to measure the dynamic effects on the state economy. The model provides estimates of the proposals' impact on employment, wages and income in Virginia. Each estimate represents the change that would take place in the indicated variable against a "baseline" assumption about the value that variable for a specified year in the absence of the cap-and-trade policy.

The Beacon Hill Institute at Suffolk University in Boston focuses on federal, state and local economic policies as they affect citizens and businesses. The institute conducts research and educational programs to provide timely, concise and readable analyses that help voters, policymakers and opinion leaders understand today's leading public policy issues.

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"… a wise and frugal government, which shall restrain men from injuring one another, shall leave them otherwise free to regulate their own pursuits of industry and improvement, and shall not take from the mouth of labor the bread it has earned. This is the sum of good government, and this is necessary to close the circle of our felicities."

Thomas Jefferson
1801