

Exploring Policy Changes Toward Climate Change Mitigation

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1.0 Abstract

This report will explore the policy changes that our government is currently undertaking in an effort to combat global climate change and reduce our national carbon footprint. It has indeed been proven that our world is emitting more carbon dioxide gas into our atmosphere than over the past 15 million years, and recent empirical evidence indicates an unforeseen shift in climate patterns should our status quo be kept. The need to reduce anthropogenic sources of carbon dioxide emissions as well as prevent severe climate change is crucial to the survival of our race as well as the future of thousands of plant and animal species.

The report is separated into three main areas. First, we will explore the current policy changes aimed at reducing our per capita carbon output. We will look at government incentives and various programs targeting average American consumers in an effort to reduce energy consumption – thus reducing our carbon emissions.

Next, we will look into the movement for greener technologies and the policy changes that will catalyze this movement. The concept of renewable portfolio standards will be assessed and its effort to reduce our dependence on fossil fuels.

Finally, we will investigate some of the policies geared directly at reducing the major carbon emitters – power utilities. We will investigate a federal cap and trade program, the efforts being made by states and the federal government towards such a movement, and look at the different legislation geared at promoting the process of carbon capture and storage.

A final assessment of these policy changes and their impact on our national carbon footprint will be evaluated.

2.0 Policy Change at Per Capita Level

One of the easiest and most immediate ways to reduce our global carbon footprint is to start at the grassroots level - with the ordinary citizen. The average American citizen emitted 20 tons of carbon dioxide into the atmosphere in the year 2004 alone, according to Energy Information Administration's "*International Energy Annual 2004*." Legislation and policy modifications aimed directly at the average consumer can drastically cut down this inflated per capita emission. Several solutions to this problem are currently being considered, including energy efficient product commercialization and various government incentives to reduce our carbon footprint.

2.1 Societal Shifts in Electrical Use

To begin, much is being done by Congress to promote energy efficient appliances and increase their commercialization. Recently passed H.R. 6, the Clean Energy Act of 2007, demonstrates some of the key strides our government has taken to promote a per capita energy efficient America.

credit for the purchase of a hybrid vehicle. A strong push for the fuel-efficient hybrid SUV's is being made, considering a brand new 2008 Mazda Tribute has one of the highest tax breaks at the \$3,000 mark.

Ultimately, the hope of such diverse grassroots campaigns is to provide immediate relief on emissions and alleviate its impact on global climate change. Gaining public support and the adoption of green ideologies is an essential start to our current crisis and must be continued in the long term to properly mitigate climate change. While it is absolutely essential to explore other technologies, other policies, and other means of reconciling our climate alterations, without the public's support and help, nothing will be changed.

3.0 Renewable Portfolio Standards

The next step in our government's attempt to battle global climate change via policy reform is in the form of renewable energy. As technology continues to improve, the promise of renewable energy sources increases dramatically. The desire for a free and endless supply to energy is drawing not only attention from the public eye, but also from our government. The establishment of a renewable portfolio standard (RPS) is yet another step in the direction of facilitating climate change mitigation.

To begin, the Office of Energy Efficiency and Renewable Energy defines a RPS as, "a state policy that requires electricity providers to obtain a minimum percentage of their power from renewable energy resources by a certain date." A RPS depends on private market implementation, and as a result, the most desirable products and cost effective technologies are produced when competition is present.

Essentially, a RPS revolves around the concept of renewable energy credits as stated by the American Wind Energy Association (AWEA). These credits come in denominations of kilowatt-hours (kWh) and offer proof that one kWh of electricity has been generated by a renewable energy source. AWEA gives an example that if an RPS is set at 5%, a generator of 100,000 kWhs would need to have at least 5,000 renewable energy credits by the end of the year, whether they produced it themselves or purchased the credits from another source.

An effective RPS would need to provide harsh penalties for non-compliance. The AWEA refers to the federal SO₂ allowance trading program as a prime example. Because it issues inflated fines at \$2,000/ton penalty, the system is self-enforcing and the EPA has never had to take any enforcement actions. The same application to a RPS is essential to its success.

According to the Environmental and Energy Study Institute, the major benefits of a RPS are that it alleviates much of our dependence on fossil energy as well as promote the development of technologically efficient renewable energy resources. Those who are most efficient at producing renewable energy will provide the credits to those who cannot efficiently compete in the market. Moreover, the desire to drive down costs of renewable energy will be great in order to keep a competitive edge in the overall energy market,

thus stimulating improvements on current technologies and the exploration of new technologies.

Furthermore, the advantage of a RPS is that it does not favor one technology over another, allowing for the advancement of all renewables without bias towards one solution. The effect is a wide range of renewable energy solutions for our growing energy needs. The market, in turn, would have the possibility of adopting the best application and best buy technology for their respective area.

For the average American, there are benefits toward adopting a RPS. According to the AWEA, each large utility-scale wind turbine alone produces more than \$1.5 million in economic activity, provides thousands of lease payments for farmers and other land owners, and contributes enormously to the local tax base. The production and generation of these renewable sources would open the job market enormously for the American public. As a result, developing a RPS could certainly stimulate economic benefits for communities in the long run.

Currently, 22 states and the District of Columbia have adopted RPS requirements. Several others have adopted RPS type guidelines, but have only made these policies voluntary, such as Illinois, Missouri, Virginia, and Vermont. Figure 3.0 and 3.1 show the states that have set some form of a RPS goal. Some seek very aggressive goals, such as New York, that will produce nearly 25% of their energy from renewables by the year 2013. Others, like Wisconsin, have set more modest goals with over 10% of their energy produced by renewables by the year 2015. From the passive to the aggressive goals, states are taking the first big step toward climate change mitigation via renewable energy.

Figure 3.0
Map of U.S. States Adopting a RPS Guideline

June 2007

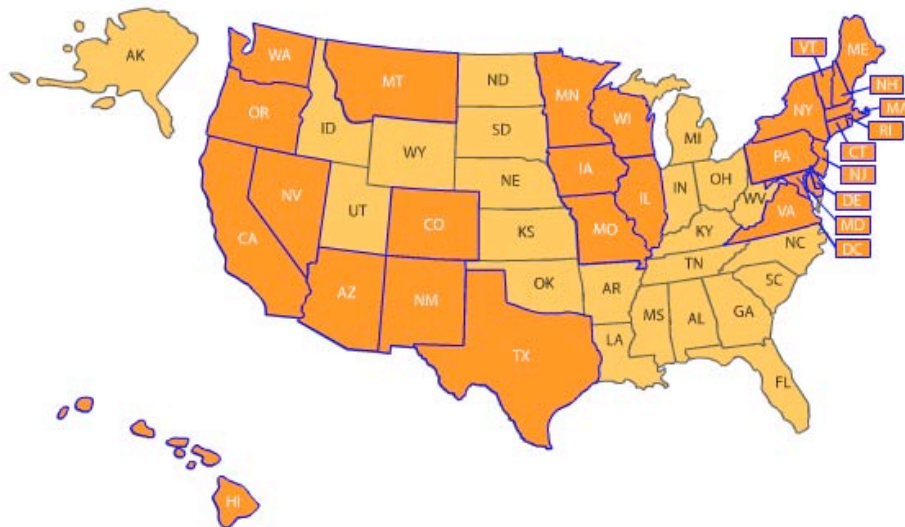
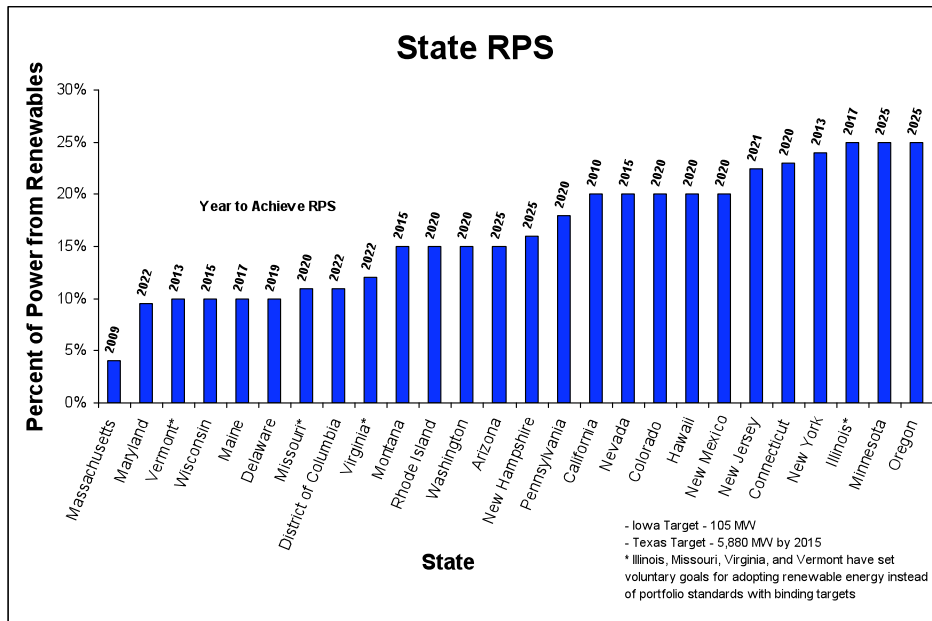


Figure taken from www.eere.energy.gov/

Figure 3.1
Graph of U.S. States and Their Respective RPS Target Percentages



Data taken from www.eere.energy.gov/

On a national level, the Senate has previously passed numerous energy bills regarding the topic of RPS, and although the House has yet to pass a RPS bill, newly introduced H.R. 969 would address such an issue. H.R. 969 seeks to amend the 1978 Public Utility Regulatory Policies Act to provide a 20% national RPS by the year 2020. It establishes a RPS in the year 2010 at 1%, increases every year thereafter until 20% in the year 2020, and sustains this RPS until the year 2039.

One of the most intriguing aspects of this bill is the economic incentive it provides to the ordinary American. While the bill provides that power utilities will receive one renewable energy credit for each kWh of renewable energy produced, the government will provide three renewable energy credits per kWh produced to any private residency that can offset part or all of their energy requirements through renewables. This added incentive encourages consumers to adopt renewable energies as they can profit from such an investment by selling their credits.

Yet one of the many challenges faced by current RPS policy makers is the definition of renewable energy. While many are obvious – wind, solar, biomass – some are not so discrete and may even have other unintended harms.

Such examples include nuclear energy and hydroelectric energy. Many supporters of nuclear energy claim it can be defined as a renewable energy due to its capacity to provide power for billions of years, yet there are great environmental concerns of proper

long-term storage of the waste. Hydroelectric power, although renewable, may have adverse environmental effects caused by damming water sources. New Scientist reports in “Hydroelectric Power’s Dirty Secret Revealed” that greenhouse gas emissions can often be substantial at hydroelectric dam’s compared to fossil plants, if not worse. In areas where the reservoir is much larger compared to the dams electricity generation and where no de-forestation took place prior to building the dam, methane and carbon dioxide build-up due to decomposition. The release of methane and carbon dioxide by these hydroelectric dams, not too mention the controversial modifications of a natural ecosystem, may outweigh the energy benefits these sources can produce.

Nonetheless, policy change towards renewable energies is gaining momentum in Congress through a RPS. In order to effectively integrate these technologies into our economy, a RPS must be set to drive renewable energy competitiveness. Until then, they will never be able to be competitive with fossil energy. Renewable energies are a great step in the direction of mitigating climate change, but their counterpart - fossil energy - still holds the front on energy resources and is the primary focus on climate change solutions.

4.0 Policy Change to Power Utilities

Accounting for nearly 40 percent of our nation’s carbon dioxide emissions, as stated by the U.S. EPA, U.S. fossil-fuel based power plants have become the major focus for policy makers and those seeking solutions to climate change. The ability to regulate and enforce emissions standards on point sources such as power utilities is much simpler as opposed to regulating vehicle or consumer emissions. Thus, this is exactly the direction our federal government is heading. The need to reduce carbon emissions from power plants in an effort to slow our changing climate is easy to see; the process by which to do such a thing is not so apparent.

Several policies have been proposed for regulating carbon emissions from power plants. Among them – and gaining the most support on both a national and global level – is the federal cap and trade program. A federal cap and trade program sets a limit on the amount of carbon dioxide that plants can emit based on their power output. If a plant emits less than their allocated amount, they have the opportunity to sell or trade those emissions’ credits. If a plant surpasses their allotted amount, they must either buy carbon credits from another provider or pay steep fines. Over the years, the cap is lowered until, theoretically, plants produce zero emissions.

One of the major problems with a federal cap and trade program concerns the economics of such a program. The issuance of allowances as well as the concept of a safety valve feature causes the most debate.

According to Resources for the Future (RFF), there are three basic ways to issue allowances. The first is grandfathering. This issuance gives power plants carbon dioxide allowances at no cost in proportion to the electricity they generate. The second is to update the issuance formula over time. The allowances would still be free of charge but

would change over time. The final option would be to auction the allowances off to the highest bidder.

Firstly, as RFF explains, the major problem with grandfathering is that it often leads to a very large allocation of free allowances in the power industry. This drives the cost of trading such allowances down and enables major utilities to purchase these excess allowances at low costs. In essence, it counteracts the purpose behind a cap and trade program to reduce emissions of power plants when they can simply buy cheap excess allowances and continue to emit high sources of carbon dioxide into the atmosphere.

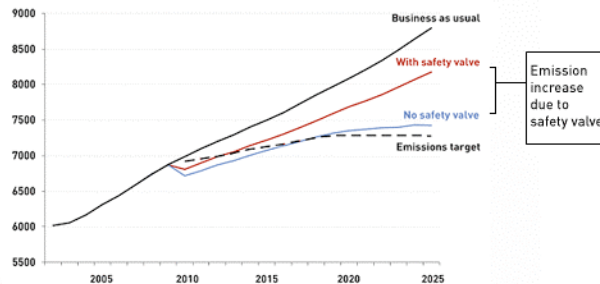
Considered a more economically feasible approach is the option to auction the allowances according to RFF. The debate of this method circles around what to do with the accrued revenue. Several propositions have been made, and it remains to decide which solution is best. Many proposals include funding research into new cleaner energy, funding carbon capture and storage programs, and distributing it among the people in the form of tax breaks to compensate for the possibility of higher electric utilities.

However, the most controversial part of a cap and trade program is the notion of a safety valve. Essentially, according to Environmentaldefense.org, when emissions allowance prices reach a pre-set level, emitters no longer have to depend on the established number of carbon allowances. Instead, they can buy newly printed allowances from the government at a potentially unlimited quantity. “It’s like printing more money when the government runs a deficit to pay off the deficit.”

The results of a safety valve system in regards to capping carbon emissions could be disastrous, as seen from the graph below. The Energy Information Administration’s projections indicate rising carbon emission levels without ever peaking at a given amount. With a safety valve system, emissions will continue to rise. Without a safety valve, emissions have the chance flatten out and eventually begin to drop. This is the primary reason why a safety valve system is so controversial. Although economically feasible, Environmental Defense states that it would provide no help in the form of reducing greenhouse gasses.

Figure 4.1
Graph of Greenhouse Gas Emissions in Relation to a Federal Safety Valve

Figure 1. Covered Greenhouse Gas Emissions in Four Cases, 2002-2025
(Million Metric Tons Carbon Dioxide Equivalent)



Source: National Energy Modeling System runs AEG2005.D102004A, BING_CAP.D021005A, BING_ICE_CAP.D021005C, and BING_NOCAP.D020805A.

Graph taken from environmentaldefense.org, Interpreted by EIA.

Currently, the United State's premier movement on a cap and trade program exists in the northeast, with the Regional Greenhouse Gas Initiative (RGGI). Eight states - Connecticut, Delaware, Maine, Maryland, New Hampshire, New Jersey, New York, and Vermont - are actively participating in the RGGI. Further, the District of Columbia, Massachusetts, Pennsylvania, Rhode Island, the Eastern Canadian Provinces, and New Brunswick are observers in the process.

According to the RGGI, their goal is to develop a multi-state cap and trade program that can be used as a platform for future state or federal programs. They seek to reduce carbon dioxide emissions while keeping energy affordable and reliable. Once the cap and trade program proves its success in the power plant sector, they will consider expanding the program into other sources of carbon emissions. Presently, research is being done to determine the type of auction for the issuance of carbon allowances.

At the federal level, Senators Bingaman and Specter proposed bipartisan legislation to reduce greenhouse gas emissions while still protecting our economy. They are modeling their bill, the Low Carbon Economy Act, after the U.S. Acid Rain Program. Under this provision, they set an annual carbon emissions target and allow firms to buy, sell, and trade credits to achieve this target.

Quoting Senator Bingaman from a press release from the U.S. Senate Committee on Energy and Natural Resources: "I believe our legislation represents a strong and balanced approach. It will dramatically reduce U.S. greenhouse gas emissions while also spurring new energy technologies, protecting the American economy and engaging developing nations in their efforts to address climate change. It's a bipartisan approach that strikes the right balance and would return the U.S. to a position of global leadership."

The Low Carbon Economy Act states it will set national greenhouse gas emissions to "2006 levels by 2020, 1990 levels by 2030, and at least 60 percent below 2006 levels by 2050." It has a safety-valve provision set-up to counteract economic uncertainty by allowing firms to make a payment at a fixed price in lieu of submitting allowances. Known as the "Technology Accelerator Payment," or TAP, the price begins at \$12 per metric ton of CO₂-equivalent and increases every year following at 5% above the rate of inflation. The bill provides the option of eliminating TAP if renewable energy alternatives are adopted or breakthrough technologies eliminate high costs of CO₂ capture and storage.

Distribution of roughly half of the allowances will initially be given out for free to the private sector, gradually being reduced every year for five years. The remaining allowances will be set aside for other purposes, including: 8% annually to create incentives for carbon capture and storage technologies, 24% to be auctioned by the government to create revenues for research of low and no carbon technologies and to provide assistance for low income families who may face financial challenges with rising energy costs, 5% dedicated to promote agricultural sequestration, 1% to reward companies who previously invested in reducing emissions, and 9% to go directly to the

States to be used at their discretion, with an emphasis on promoting new technologies, low carbon technologies or further assist low-income residents.

The primary concern with the Bingaman-Specter Bill is the TAP safety valve provided in the legislation. Although its price rises with inflation, and can be removed in the presence of new and better technologies, undoubtedly the majority of the debate will circle around this feature of the bill.

While a federal cap and trade program is on the forefront of policy change in mitigating carbon emissions, the technologies needed to economically capture and dispose of carbon dioxide are still being developed. Currently, the only bill in Congress that directly addresses carbon capture and storage technologies is the Global Warming Pollution Reduction Act sponsored by Senators Sanders and Boxer. This act amends the Clean Air Act to specifically reduce carbon emissions.

The Global Warming Pollution Reduction Act seeks to keep average global temperatures 3.6 degrees Fahrenheit below pre-industrial averages as well as sustain 450 ppm or less of carbon dioxide equivalent in the atmosphere.

In order to do this, the act seeks to establish rules for the safe geological sequestration of carbon dioxide through a competitive grant program via the EPA. In the area of carbon capture and renewable energies, it stipulates that “federal funds for clean, low-carbon energy research, development, and deployment should be increased by at least 100% each year for the next 10 years.”

As it is very apparent, the basis for carbon emission policy change in the power sector is the development and integration of carbon capture and storage technologies. Revenues produced by a cap and trade program or granted from the federal government seek to further advance these technologies. Without a more advanced, efficient, and proven system to capture and sequester carbon dioxide, the movement towards a federal cap and trade program will never gain momentum or, even worse, our nation will pay huge economical penalties to cover for our technological shortfalls.

Conclusively, carbon emission regulations on power utilities and the advancement of carbon capture and sequestration technologies is an important step in the direction of climate change mitigation. Fossil energy is the cheapest and most readily available energy for our market today. It is necessary to reduce the negative effects of this great energy commodity before it negatively impacts our world even more than it already has.

5.0 Conclusion and Interpretation of Research

In summary, our government has taken enormous strides in the direction of mitigating climate change. New policy initiatives aimed at the average consumer to reduce their carbon footprint, creating a RPS, and establishing a cap and trade program along with the technologies needed to make it feasible are all a positive step towards protecting our earth and ourselves from catastrophic climate disasters.

Yet the complicating factor remains. Viewing these three approaches alone will certainly yield positive results, and we may even see some positive effects from just one of their implementations. However, in no way will one approach solve our current climate crisis in the long-term. It is of utmost importance that all three climate mitigation proposals work in tandem.

Renewable energy may be able to solve the energy problems we will face years from now. It also, for the most part, has no adverse effects on our environment and climate. Yet in no way is it able to compete with fossil energy. A RPS is a good attempt to gain momentum for renewable energy technology, but until fossil energy emissions are regulated and renewables can compete on the same playing field as their energy counterpart, then their wide-scale implementation will never exist.

Fossil energy is and will be our main source of energy in the coming years. Coal in the United States alone has more than 300 years of supply at current rate according to the American Coal Foundation, efforts are being made to utilize methane beds, and fossil energy will still be our cheapest energy source for our energy needs. Yet the pollution from such sources may outweigh the very economical benefits they have. The future of our climate and the global economical consequences that may come about due to power plants' continued unregulated emissions is dismal. Until their emissions are regulated and technology improves to make them cleaner, they will continue to provide cheap yet environmentally damaging sources of energy.

Humans are the last piece of the energy puzzle. We dictate emissions, we control our lifestyles, and we choose the actions that have a direct impact on the environment. For every person that goes out of their way to buy compact fluorescents, carpool to work, open their home windows instead of blasting the air conditioning, and invest their money in green technology, there exists someone else out there who uses incandescent light bulbs and leaves them on all day, drives an hour to work every morning alone while their neighbor works the same job, puts the air conditioning on when it is 70 degrees out, and goes to buy that brand new hummer instead of looking at a hybrid. Until we all start functioning on the same page, every person who goes out of their way to reduce their carbon footprint will be counteracted by those who have no regard for the impact they are having on our environment.

Herein lays my final argument. If a cap and trade program began in the immediate future while the American lifestyles remained the same as they are today, little effect on carbon emissions would be seen. We would continue our wasteful habits and if anything, develop a false sense of security that we do not need to be energy efficient since power plants' carbon emissions are now regulated, and they may even be able to capture some of those emissions. If the majority of citizens became more energy efficient and a RPS was adopted while fossil energy plants' emissions went unchecked, the overall output of carbon emissions would still be substantial. Renewables would still have an incredibly difficult time competing with their economic, unregulated energy counterpart. One solution alone will not solve our energy needs and climate problems.

The time to change is now. If we do not come together as citizens, as private companies, as a government, as the entire world – the very future of this world will pay due to our inability to change. Our government has taken the important steps in the direction of positive policy reform. Americans must reduce their carbon footprint, renewables must advance their technologies, and fossil energy plants must be regulated and clean their emissions. It is absolutely imperative to integrate all three views as one immediately; else little effect on climate change mitigation will ever be achieved and the time to change our policies will have been missed.

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