THE HAMILTON PROJECT

Advancing Opportunity, Prosperity, and Growth

POLICY BRIEF 2011-04

Promoting Clean Energy in the American Power Sector

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The Hamilton Project seeks to advance America's promise of opportunity, prosperity, and growth. The Project's economic strategy reflects a judgment that long-term prosperity is best achieved by fostering economic growth and broad participation in that growth, by enhancing individual economic security, and by embracing a role for effective government in making needed public investments. We believe that today's increasingly competitive global economy requires public policy ideas commensurate with the challenges of the 21st Century. Our strategy calls for combining increased public investments in key growth-enhancing areas, a secure social safety net, and fiscal discipline. In that framework, the Project puts forward innovative proposals from leading economic thinkers — based on credible evidence and experience, not ideology or doctrine to introduce new and effective policy options into the national debate.

The Project is named after Alexander Hamilton, the nation's first treasury secretary, who laid the foundation for the modern American economy. Consistent with the guiding principles of the Project, Hamilton stood for sound fiscal policy, believed that broad-based opportunity for advancement would drive American economic growth, and recognized that "prudent aids and encouragements on the part of government" are necessary to enhance and guide market forces.

ADVISORY COUNCIL

Promoting Clean Energy in the American Power Sector

The difficulty of securing bipartisan agreement on a comprehensive national energy and climate change policy points to the need for an incremental approach rather than continued inaction. In his Hamilton Project discussion paper, Joseph Aldy of the Harvard Kennedy School proposes a promising step forward: a detailed framework for a National Clean Energy Standard (NCES) that would apply to the nation's power sector. The standard would reduce carbon dioxide (CO_2) emissions in the power sector by as much as 60 percent over twenty years relative to 2005 levels, streamline the fractured regulatory framework currently in place, and serve as an ambitious step towards economy-wide emission reductions.

The Challenge

The power sector in the United States emits more CO_2 than is emitted from all sources combined in any country except for China. In the United States, the power sector is responsible for 30 percent of emissions, more than any other sector of the economy. While increased reliance on natural gas and renewable energy sources is expected to lower the power sector's future emission intensity—the amount of CO_2 emissions produced per unit of electricity generated—this reduction probably will be quite small. In the absence of a concerted effort to reduce emissions, the emission intensity of the power sector will likely remain steady at about half a ton of CO_2 emissions per megawatt hour of electricity generated.

To date, the federal government has not put forth any policies aimed at reducing the greenhouse gas emission intensity of the power sector, but in absence of federal action, states have moved ahead. Twenty-nine states and the District of Columbia already have renewable and clean energy mandates in place. An additional five states have renewable goals. But a patchwork approach to regulation fails to realize the efficiencies that would be gained from a national system.

The Environmental Protection Agency (EPA) has the authority to regulate greenhouse gas emissions under the Clean Air Act. Under this authority, it also could design a system to reduce CO_2 emissions in the power sector. The system that would likely emerge, however, may lack some important features such as broad coverage, cost-lowering flexibility, and price certainty. Congressional review and successive legal challenges to the EPA's authority also make considering other regulatory options desirable.

A New Approach

Aldy provides a detailed framework for a National Clean Energy Standard (NCES) that would serve as a "bridge" to a more comprehensive approach to climate change. The standard would reduce CO_2 emissions in the power sector in a cost-effective way, streamline the currently fragmented regulatory framework, produce meaningful fiscal benefits, and support energy innovation.

The NCES would be based on emission intensity: the amount of CO_2 emitted from a given amount of electricity generated (measured in tons of CO_2 per megawatt hour). This is a simple but powerful way to define "clean energy" that focuses on environmental impact.

In 2015, the standard would be set to 0.4 tons of CO_2 per megawatt hour. Every year, the standard would tighten by 0.01 tons of CO_2 per megawatt hour, resulting in a performance target of 0.2 tons of CO_2 per megawatt hour in 2035—roughly equivalent to an 80 percent clean energy portfolio. Since CO_2 emissions and megawatt hours of generated electricity are already tracked at U.S. power plants, data to monitor compliance under the new standard would be relatively easy to collect.

The proposed standard would be implemented over a twenty-year period, beginning in 2015. It would consist of performance targets that represent "reach" goals (see Table 1 for a proposed schedule of targets), starting from the power sector's current emissions intensity of 0.56 tons of CO_2 per megawatt hour.

TABLE 1

National Clean Energy Standard Goals

Year	Clean Energy Standard (tCO_2/MWh)
2015	0.40
2020	0.35
2025	0.30
2030	0.25
2035	0.20

The NCES that Aldy proposes has four key features that make his proposal effective yet flexible: technology-neutral performance metric based on emission intensity, flexibility through tradable credits, price certainty, and a Clean Energy Fund that would channel revenue raised under the standard towards energy R&D and technology demonstration.

Technology-neutral performance metric. All power sources, from fossil fuels to renewables, would be eligible under the proposed NCES. This has the advantage of keeping the doors to innovation open and of enabling all sources in our current energy mix to contribute towards the standard.

Flexibility through tradable credits. Power plants would be awarded credits for generating cleaner (less-emission-intensive) electricity than the performance standard. These clean power plants could sell the credits to other power plants or save them for use at a future date. Tradable credits promote cost-effectiveness by encouraging the greatest deployment of clean energy from those power plants that can lower the emission intensity of their power at lowest cost. Power plants that are able to do so would then sell their extra credits to other power plants that face higher costs for deploying clean energy.

Price certainty. In addition to either meeting the standard on their own or buying tradable clean energy credits, there is a third option for power plants proposed by Aldy: buying clean energy credits from the government. In 2015, the price for federal clean energy credits would be $15 per credit. It would increase by 7 percent annually, above inflation, to reach $30 by 2025—roughly equaling the cost of damages associated with a marginal ton of CO_2 emissions, known as the social cost of carbon. In this first decade of the policy, renewable and nuclear power facilities would generate an average revenue stream of $21/MWh, equal to the value of the renewable production tax credit and exceeding the value of the nuclear production tax credit. Beyond 2025, the federal clean energy credit price would increase by 2.4 percent annually to keep up with the expected increase in marginal damages from CO_2 emissions.

By selling clean energy credits, the government can ensure that no power plant will be forced to pay more to deploy clean energy that lowers carbon emissions than the estimated social cost of those emissions. This "safety valve" allows firms to form expectations and plan against an expected credit price. Without such a mechanism in place it is possible that the market price of emission credits would be volatile and could rise well above the socially optimal level. The price for federal clean energy credits is expected to be binding. When this price is reached and firms begin to buy credits from the government, these sales will become a new source of revenue.

A Clean Energy Fund. Revenue raised through the sale of federal clean energy credits would be directed to a Clean Energy Fund that supports energy R&D and first-of-a-kind technology demonstration projects. In 2015, $2 billion of revenue would be dedicated for this purpose. The amount of revenue directed to the Clean Energy Fund would rise by 10 percent every year, reaching $5 billion in 2025. Revenue collected above this amount could be used for deficit reduction or reducing current tax rates, such as the payroll tax rate.

Costs and Benefits

Benefits

Aldy argues that his proposed NCES would have a number of benefits. It would significantly reduce emissions in the power sector, facilitate investment, produce fiscal benefits, and generate a revenue source for basic energy R&D. The standard would likely have only a modest impact on the price of electricity and production in energy-intensive manufacturing.

Emissions

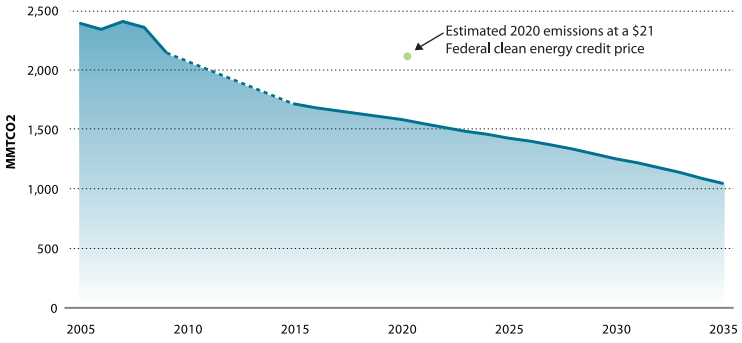
If the power sector met the standard's 2020 target, emissions would be about one-third below 2005 levels (see Figure 1). By 2035, emissions would be approximately 60 percent below 2005 levels. Even if this performance goal is not achieved because power plants prefer to buy federal clean energy credits, substantial emission reductions would likely be achieved. In this case, analysis from a recent carbon pricing study by the Energy Information Administration suggests that emissions could fall 15 percent below 2005 levels by 2020 in the power sector, or about 13 percent below the business-as-usual case. Reductions would be consistent on a sector-specific basis with international climate change commitments the United States has made.

Policy and price certainty

The U.S. power sector is currently subject to a fragmented regulatory framework that exists at the state level, and uncertainty about the form, stringency, and timing of federal regulation under the Clean Air Act. An NCES would replace and simplify this system and establish a common performance target that all power plants could plan against. The standard also would provide price certainty by establishing a ceiling for the price of clean energy credits, thus facilitating investment by firms and energy developers.

FIGURE 1

U.S. Power Sector Carbon Pollution 2005–2009 and Estimated through 2035 with National Clean Energy Standard Performance Goals



Source: Aldy (2011) based on Energy Information Administration, "Energy Market and Economic Impacts of the American Power Act of 2010."
Note: The 2015–2035 estimates reflect an assumption that the performance goals are met without accessing the federal clean energy credits and a conservative assumption that generation levels do not fall relative to the expectation under the status quo.

Fiscal benefits

The standard would have two fiscal benefits. First, it would establish demand-side incentives for the production of clean energy that could at least partly offset the need for supply-side subsidies in the form of credits and grants.

Second, the standard would generate revenue for the government through the sale of clean energy credits. The exact amount of revenue that the government raises depends on the number of federal credits purchased. Analysis drawing from a recent carbon pricing study by the Energy Information Administration suggests that the emission intensity of the power sector would fall to 0.5 tons of CO_2 per megawatt hour at a price of $15 per credit in 2015. In order to come into compliance with that year's performance target of 0.4 tons of CO_2 per megawatt hour, power plants would have to buy $6.5 billion in federal clean energy credits. The first $2 billion would support the Clean Energy Fund, but excess funds could be used for deficit reduction or to support payroll tax reductions, alleviating the moderate impact of higher energy prices on families.

Roadmap

- All power sources would be covered by the National Clean Energy Standard (NCES) which would be set by a performance metric based on emission intensity.
- The NCES would be administered jointly by the Environmental Protection Agency and the Department of Energy.
- Standards would be implemented over a twenty-year period, beginning in 2015 with a standard of 0.4 tons of CO_2 emissions per megawatt hour of electricity produced. The standard would tighten by 0.01 tons of CO_2 per megawatt hour annually, reaching a target of 0.2 by 2035.
- Power plants generating power that fail to meet the performance goal could comply with the policy by purchasing clean energy credits, either from other utilities or from the federal government.
- Credits would be denominated as one ton of CO_2 and would cost $15 in 2015. Credit price would increase 7 percent annually, above inflation, reaching $30 by 2025. After 2025, the price would increase by 2.4 percent annually.
- Compliance would be demonstrated during a three-month window after each compliance year.
- Revenue raised would be directed to a newly created Clean Energy Fund that supports energy R&D and first-of-a-kind demonstration projects.
- Starting in 2015, the first $2 billion in revenue would be directed to this fund, with revenue rising 10 percent annually. Remaining revenue would be used for deficit reduction or reducing current tax rates to help alleviate the impact of higher energy prices on lower and middle income families

Learn More About This Proposal

This policy brief is based on The Hamilton Project discussion paper, Promoting Clean Energy in the American Power Sector, which was authored by:

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Additional Hamilton Project Proposals

An Energy Technology Corporation Will Improve the Federal Government's Efforts to Accelerate Energy Innovation

Energy innovation is critical to solving many of the energy and environmental challenges we face today, from reducing the risks of climate change to lowering the costs of alternative energy sources. While there is no shortage of new ideas, a major obstacle stands in the way of implementation: proving that these ideas work and are worthy of expensive investment. The private sector underinvests in technology demonstration because of the expense and uncertainties involved; at the same time, previous demonstration programs carried out by the Department of Energy have met with mixed results. This paper proposes a series of best practices for government support of U.S. technology demonstration and a new institution, the Energy Technology Corporation, that would be responsible for managing and selecting technology demonstration projects.

A Better Approach to Environmental Regulation: Getting the Costs and Benefits Right

Cost-benefit analysis of environmental regulation plays a key role in determining how to achieve our environmental goals without imposing unnecessary costs on the economy. This paper proposes three reforms that address several problems that undermine the role played by cost-benefit analysis in environmental regulation. First, agencies should be required to use a checklist of good empirical practices and should promote decentralized evaluations of data and research. Second, absent compelling systematic evidence to the contrary, agencies should presume that consumers are best able to make their own energy-saving decisions, and should focus on regulations that address the harm that people impose on others. Third, a six-month early regulatory review process should be established for particularly important regulations to allow sufficient time for a thorough cost-benefit analysis and the incorporation of the results into the final regulations.

Support for Energy Innovation

Revenue directed to the proposed Clean Energy Fund would help support energy R&D and technology demonstration. These are critical supplements to the NCES, because they pave the way for technology innovations that can help lower the price of alternative energy sources and mitigate the risks of our current energy mix.

Costs

Electricity prices. Across the United States, the price of electricity in 2015 would likely rise by less than 3 percent of the average retail price forecasted for electricity. The precise impact of the standard on electricity prices would vary from state to state, however, given the different regulatory regimes and mix of power-generating technologies in place. Two of every three states would have lower electricity prices in 2015 under the NCES than they did in 2008.

Manufacturing. Electricity rates are expected to rise in the industrial sector by 4.1 percent in 2015. This increase would have little effect on production in the manufacturing sector as a whole, reducing production by less than 1 percent.

Conclusion

An NCES that applies to the power sector is a promising intermediate step towards a more comprehensive system for addressing climate change. It would target a large source of carbon emissions in the United States and the world, putting the country on a path to reduce the environmental, health, and other social costs of climate change.

Aldy's approach to a clean energy standard would replace a patchwork regulatory system. The performance standard coupled with the availability of emission credits serve as an effective but flexible way to produce meaningful social and fiscal benefits with limited costs.

Questions and Concerns

1. Why shouldn't the EPA use its existing authority to reduce emissions in the power sector?

The EPA has the authority to regulate greenhouse gas emissions under the Clean Air Act and could design a system similar to that envisioned under the proposed NCES, but there are a number of reasons to believe this is a less-desirable approach. First, it may be difficult for the EPA to replicate the breadth of coverage of this proposal. The standard would cover new and existing power plants as well as zero-emission nuclear and renewable power facilities. Second, the EPA would be unlikely to include a mechanism for ensuring price certainty. With a clean energy standard, the government's price for clean energy credits sets a price ceiling for emission reductions. Price certainty is important for facilitating investment and preventing a spike in the price of electricity. Without such a mechanism, moreover, no revenue would be raised for energy innovation. Third, the EPA's push to regulate greenhouse gas emissions also would be more likely than an NCES to face congressional review and legal challenges. Fourth, without legislation that clearly sets out an NCES, there could be pressure for the EPA to use other measures in the Clean Air Act to address emissions in the power sector. These could be more costly and less effective than EPA's preferred approach.

The proposed NCES would explicitly preempt both the EPA's authority to regulate CO_2 emissions in the power sector and state-level clean energy mandates.

2. Is there precedent for an intensity-based performance metric?

Using an intensity-based performance metric is standard practice in the push to promote cleaner electricity generation. Both the Bush administration and the Obama administration proposed intensity-based performance metrics for regulating conventional air pollutants. Power plants and state and federal regulators are familiar and experienced with using this type of metric. Also, the federal government successfully used an emission-intensity approach with tradable credits in the 1980s to lower the amount of lead in gasoline.

3. Why is there no exemption for smaller plants?

The risk of an exemption for smaller plants is that utilities or manufacturing facilities would shift more of their generation to these units in order to minimize the need to comply with the standard. This would dilute the incentive to innovate and reduce the standard's effectiveness. It may be possible, however, to exempt some very small plants in the same way that the EPA exempts very small plants from some of its conventional air pollutant regulations, without reducing the efficacy of the standard.

Highlights

Joseph Aldy of the Harvard Kennedy School of Government proposes the establishment of a National Clean Energy Standard (NCES) that applies to the U.S. power sector.

The Proposal

A technology-neutral, emission intensity-based standard. There are many ways to define "clean energy." A technology-neutral approach based on emission intensity would enable all sources in our current energy mix to contribute towards meeting the standard. It also would keep government focused on the bottom line—environmental outcomes—instead of on picking winners and losers.

Tradable clean energy credits. Power plants would be able to trade clean energy credits. Clean facilities that beat the standard generate credits than can be sold to less-clean facilities that fail to meet the emission-intensity performance goal. If the price of credits exceeds a preset level, power plants would be able to buy credits from the federal government.

A Clean Energy Fund. Revenue raised under the standard would go towards a Clean Energy Fund that would support energy innovation through R&D and technology demonstration. About $2 billion in revenues would be initially dedicated in 2015, ramping up to $5 billion in 2025.

Benefits

The National Clean Energy Standard Aldy proposes would significantly reduce CO_2 emissions in the power sector, streamline the existing regulatory framework, fund energy innovation, and serve as a bridge to a more comprehensive economy-wide carbon pricing system.

THE HAMILTON PROJECT

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BROOKINGS