



CLEANER ELECTRICITY AND LESS OF IT

The Prospects for Reducing CO₂ Emissions by Requiring Renewables and Energy Efficiency

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The Senate's failure to pass comprehensive cap-and-trade legislation for greenhouse gases during the last session of Congress and the ongoing skirmishing about climate policy this election season are clear signs that a federal policy that imposes a price on emissions of carbon dioxide (CO₂) will not be enacted anytime soon. This change in course on the policy front introduces a fair amount of uncertainty about how many emissions reductions can be achieved using a collection of more targeted strategies instead of imposing a comprehensive emissions cap and at what cost.

For example, the climate legislation that passed the House in 2009, the Waxman-Markey bill, promised a 17 percent reduction in CO₂ emissions below 2005 levels by 2020. Will it be possible to achieve cuts like these using alternative measures, such as policies to promote renewables and energy efficiency? The answer to this question depends on what types of policies are adopted, specific aspects of their design, and the context in which they are implemented, including what other policies are included in the mix.

Much like the devil, the tons of carbon and the amount of dollars necessary to obtain them are in the details of these policies.



Renewables Policies

In the United States, two of the main policy approaches to encouraging greater use of renewable sources of electricity are tax incentives at the federal level and renewable portfolio standards (RPS), also known as renewable electricity standards (RES), which have been enacted in 29 states and the District of Columbia. For new renewable generators brought online between 2009 and the end of 2013 (2012 for wind), the federal production tax credit policy provides a 2.1 cent tax credit for every kilowatt hour (kWh) generated using wind, geothermal, and closed loop biomass, and a 1.1 cent per kWh tax credit for other nonhydro renewables (not including solar, which is eligible for an investment tax credit). The production tax credit applies to all generation during the first 10 years of operation.

The RPS works by requiring that a minimum percentage of electricity generation or sales within the state be supplied by qualified renewables and that percentage goes up over time. (The set of qualified renewables and the minimum percentage varies across states.) It is typically implemented through the use of renewable energy credits, or RECs, that are created whenever a kWh of electricity is generated by a qualified renewable electricity generator. In several states, RECs are tradable within the state and RECs from other states may also be allowed. Some states also include an alternative compliance payment which acts as a ceiling on the price of RECs and helps contain the cost of the policy, but could also limit its effectiveness in encouraging renewable electricity investment.

In general, an RPS is less effective than cap and trade or any policy that prices CO₂ directly because it does not differentiate among nonrenewable technologies based on CO₂ intensity. The RPS basically imposes a tax on all the kWh generated using nonrenewables that are included in

the basis, but this tax is the same for a kWh produced with natural gas, nuclear, and coal despite their very different CO₂ emissions impacts. The RPS also tends not to have a big effect on electricity price in those regions where electricity is priced competitively. Unlike a cap-and-trade policy, it does little to encourage electricity conservation. This lack of price effect should not be interpreted as a lack of cost because RPS policies do impose costs, which typically will be passed on to consumers in regulated regions. But in competitive regions, much of the cost is born by generators that will see their profits fall as a result.

RFF research suggests that a federal RPS will yield substantially lower CO₂ emissions reductions than recent cap and trade proposals, and the cost per ton of CO₂ reduced will be between 15 and 60 percent higher than the cost per ton for a cap-and-trade policy, depending on how the policy is designed. If the alternative compliance payment is binding, raising it will yield additional emissions reductions. Expanding the scope of the portfolio standard to include a broader range of clean energy technologies beyond renewables – such as incremental nuclear and fossil technologies with carbon capture and storage – will lower the cost per ton, but will also lower the likely emissions reductions unless the minimum targets are increased substantially and existing non- and low-emitting generators are also included in the standard.

Energy Efficiency

There is little doubt that investments in more energy-efficient technologies for lighting, air conditioning, refrigeration, and other energy services could reduce CO₂ emissions *and* reduce consumers' energy bills, all else being equal. The explanations for why these investments are not being made today range from the possibility that their true costs may be higher than suggested by engineering studies, households and businesses have other



investment options that promise a higher return, or consumers don't have good information about these opportunities and misperceive or miscalculate the net benefits. The difference between the energy-efficiency level that exists and what could be achieved with these cost-effective investments is known as the "efficiency gap."

A number of policies designed to close this efficiency gap have been implemented at various levels of government, including federal and state minimum efficiency standards for appliances, state and local building codes, mandatory energy-efficiency labels, programs that identify and label energy-efficient choices for consumers (Energy Star), low-cost financing for energy-efficiency investments, and incentives for purchase of efficient appliances.

Energy-efficiency provisions in the climate bills and other pieces of federal energy legislation would expand the use of appliance standards and building codes and provide greater financial incentives for end-user investments in energy efficiency. A policy approach that a number of states are taking, which has been suggested at the federal level as well, is an energy-efficiency resource standard (EERS). Similar to an RPS, an EERS requires that electricity retailers and, in some cases, natural gas distributors, provide evidence of energy savings from efficiency programs and investments equal to a minimum percentage of total electricity (or natural gas) sales in a particular year. This policy would also be implemented through the creation of energy-efficiency credits (EECs) that could be traded.

The challenges raised by this type of policy – and evaluating how effective it will be in yielding energy savings and emissions reductions – are numerous. Chief among them is identifying the appropriate baseline level of energy consumption against which savings are to be measured. Additional challenges include:

- How should the savings produced by other policies and programs such as appliance standards and building codes be treated in the calculation of savings attributable to the EERS?
- What are the appropriate ways to translate measures of gross energy savings suggested by efficient appliance purchases or participation in rebate programs into net energy savings that are truly attributable to the policy measure?
- How will regional differences in energy savings due to largely weather-related differences in energy service demand and efficiency of the current capital stock be handled in a federal program?

Other factors that make quantitative analysis difficult include possible rebound effects due to lower costs of energy services and potential spillover effects that reduce electricity consumption for those firms not participating in the program. Estimating the emissions reductions will also depend on what types of generation are being displaced by the efficiency investments. As the targets for state-level renewables programs get more ambitious, a growing portion of the energy that is displaced could be from renewables, which would diminish the emissions reducing potential of these policies. Moreover, to the extent that standards for greenhouse gas emissions under the Clean Air Act reduce emissions from existing and new fossil generators, they will also lower the emissions that would be displaced by energy-efficiency policies.

Combined Renewable and Efficiency Standards

Most of the recent federal legislative proposals to promote cleaner sources of electricity link RPS and EERS policies. For example, the Renewable Energy Promotion Act of 2010, proposed in September 2010 by Senators Bingaman (D-WY) and Brownback (R-KS), incorpo-



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rates energy efficiency into the RPS by allowing for just over 25 percent of the renewables standard to be met by savings from certain energy-efficiency programs, including incentive and information programs operated by utilities or state efficiency agencies.

Linking policies in this way increases flexibility in how utilities can comply and, therefore, presumably lowers costs and increases political acceptability. But that flexibility is also the source of uncertainty about the future value of RECs, which are an important source of income for renewables developers. Up until now, they have not needed to consider the results of energy-efficiency measures, which are understandably hard to quantify, and their effect on the market price of RECs. Under a linked policy, renewables developers will be wary of competing with energy-efficiency programs that could generate large amounts of credits and insist on strict verification.

Bringing more parties to the table raises the likelihood that the energy savings attributed to a particular efficiency program are real. However, it also might complicate and delay the process of assigning net electricity savings to particular investments, which could offset some of the anticipated cost savings of a combined policy. Much will also depend on which efficiency measures are part of the EERS policy and which are incorporated into the baseline.

Bundling renewables and efficiency into a single standard also limits the extent of technological “learning by doing” that could result when compared to an identical RPS that focuses on renewables only. (Learning by doing is a concept in economics that refers to the capability of workers to improve their productivity by regularly repeating the same type of action.) How large this effect is likely to be depends on the potential for “learning” to yield reductions in cost of manufacturing, installing, and operating renewable facilities. This potential is

the subject of a great deal of uncertainty and likely to vary across different technologies. If some renewable technologies have a greater potential for “learning,” the policy could be designed to give more than one credit to those technologies for some period of time in order to encourage their use relative to the more mature and lower cost renewables typically favored by an RPS.

The mix of electricity savings from energy efficiency and electricity generation from renewables induced by a combined policy will depend in part on the incentives that state regulators provide for utilities to invest in energy efficiency. Typically, revenues and profits of regulated utilities selling electricity distribution services increase with electricity sales. When this is the case, utilities have a disincentive to invest in efficiency. To mitigate this disincentive, measures to decouple revenues from sales have been enacted in a number of states and some states have gone even further to provide incentive payments for utilities that can demonstrate certain levels of energy savings attributable to efficiency programs. Measurement difficulties aside, having these types of policies in place should not only increase the willingness of utilities to invest in energy savings but also the relative contribution of energy efficiency to these combined standards.