ENVIRONMENTAL ECONOMICS

An economic perspective on the EPA's Clean Power Plan

Cross-state coordination key to cost-effective CO_2 reductions

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In June, the Obama Administration unveiled its proposal for a Clean Power Plan, which it estimates would reduce carbon dioxide (CO_2) emissions from existing U.S. power plants 30% below 2005 levels by 2030 (see the chart). Power plant emissions have declined substantially since 2005, so the plan is seeking reductions of about 18% from current levels. Electricity generation accounts for about 40% of U.S. CO_2 emissions.

The Environmental Protection Agency (EPA) is seeking public comment on the proposed plan before issuing a revised and final rule in June 2015. The proposed plan, which is likely to undergo substantial revision, has been shaped by a confluence of technical, political, legal, and economic factors. Here, we point out, from an economics perspective, some of the main attractions and potential weaknesses of the current proposal. We focus on key design features that will affect whether the plan achieves its intended emissions reductions and on what can be done to help minimize the economic costs of meeting the plan's requirements.

POLICY

In the absence of new federal legislation, the main channel for a national climate-change mitigation policy is action by the Executive Branch under authority of the Clean Air Act. The plan seeks to regulate emissions from fossil fuel–fired power plants in three steps. First, the EPA identifies "adequately demonstrated" approaches for reducing emissions in the power sector. Second, the EPA derives state-specific emissions standards based on these demonstrated approaches, taking into account the characteristics of each state's power sector. Third, states are obligated to design and implement plans to reduce their emissions and meet the EPA's designated standard.

There are vast uncertainties associated with estimates of the benefits and costs of the plan. The required Regulatory Impact Analysis accompanying the plan (*1*) estimates that, under most scenarios, benefits will exceed costs by a considerable margin. One central estimate puts benefits in the year 2030 at $76 billion, with projected compliance costs of $9 billion. Estimated benefits include avoided climate-related damages in both the United States and other countries. The Administration's rationale for including other countries is that addressing global climate change will require all countries to pursue policies based on consideration of global costs and benefits associated with their own actions.

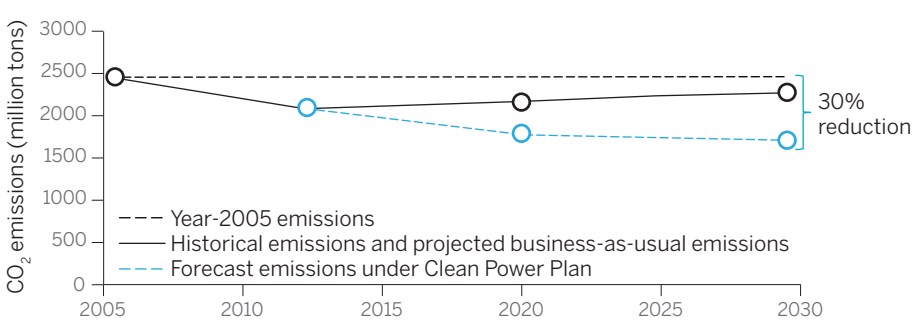
Also included in the benefits are domestic "nonclimate" effects. To the extent that the plan leads to reductions in CO_2 emissions from fossil-fuel plants, there will also be reductions in other pollutants, with associated benefits to health and the local environment. Drawing from existing studies, the EPA considered health benefits from reductions in particulate matter and ground-level ozone. These reductions were estimated to yield about 60% of the plan's gross benefits.

WILL INTENDED REDUCTIONS BE ACHIEVED? Although the Administration hopes that the plan will bring about emissions reductions of a given magnitude, the plan does not specify particular levels of emissions reductions that states must achieve. Instead, compliance requirements are expressed as an emissions ratio, building upon EPA's considerable experience with regulatory requirements defined in this way. The numerator of the ratio measures pounds of CO_2 emitted by sources covered under the plan. The denominator is a measure of electricity generation at most existing sources, with an adjustment to account for generation avoided due to demand-side efficiency improvements. The quantity of emissions associated with meeting the standards depends on both the level of emissions (in the numerator) and the level of electricity generation (in the denominator). The Administration's estimate of emissions reductions thus depends on its forecasts of electricity generation.

Each state has the option to convert the ratio-based requirement into a mass-based limit on the quantity (i.e., tons) of CO_2 emitted. In principle, this involves multiplying projected electricity production at affected generating units in the state by the target emissions ratio. In practice, the modeling and assumptions required to make the state-level conversions will be complicated, and many details are unspecified in the proposed plan.

The use of a ratio-based standard makes for a loose connection between meeting the required emissions-output ratio and achieving the Administration's forecast emissions reductions. If a state chooses to maintain a ratio-based standard rather than convert to a mass-based limit, it could potentially meet the EPA's requirement without lowering emissions. A state could bring down its average emission ratio by simply increasing production of low-carbon—but not necessarily no-carbon—electricity. Although the extent to which this will undermine the plan's goal for emission reductions is uncertain, economic analysis of ratio-based standards in other sectors has revealed considerable potential for these unintended effects (*2*).

Projected CO_2 emissions impacts of the proposed power plan



Data from (*1*).

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Another issue with ratio-based standards concerns programs for demand-side energy efficiency improvements (such as programs designed to increase the adoption of more-efficient appliances). These can offer a cost-effective way for states to cut emissions by reducing electricity consumption. To receive credit for energy efficiency improvements under a ratio-based standard, efficiency-induced reductions in electricity demand are added to the denominator in calculating the state's emissions ratio. The problem is that accurately measuring how efficiency investments affect electricity demand is notoriously difficult, and recent studies indicate that savings are frequently overestimated by a wide margin (*3*). Overestimation of gains from energy efficiency will in effect reduce the stringency of a ratio-based standard.

Under a mass-based approach, the two concerns discussed above no longer apply. There is no incentive for a state to increase electricity production so as to reduce an emissions ratio. Efficiency measures would contribute directly to compliance under a cap by reducing demand for electricity, and therefore emissions, without any need to estimate savings for compliance purposes. A mass-based approach would also be administratively simpler and would provide greater certainty about the plan's impact on emissions. Moreover, for states that already have mass-based policies limiting greenhouse gas emissions, mass-based standards are more easily integrated into the existing regulatory framework

Despite the various attractions of a mass-based approach, it is far from certain that states will choose this compliance option. Ratio-based standards have more built-in flexibility. While maintaining the same emissions ratio, states can expand and contract emissions in response to changing economic conditions that affect electricity demand and supply.

To ensure that ratio-based standards meet their objective, the EPA should establish detailed protocols and guidance for evaluation, monitoring, and verification of efficiency programs. The EPA should favor field-based savings estimates over engineering estimates and should encourage evaluators to take advantage of state-of-the-art approaches to program evaluation.

WILL WE PAY TOO MUCH FOR EMISSIONS REDUCTIONS? To reduce emissions cost-effectively, it is critical to adopt a flexible structure in which lower-cost options can be favored over higher-cost ones. Several features of the plan are consistent with this flexibility principle.

The plan offers within-state flexibility in how each state can comply with its standard. When setting the standard for each state, the EPA considered a range of demonstrated methods for reducing emissions, including efficiency improvements at power plants, greater use of natural-gas plants, expansion of renewables, and demand-side energy efficiency programs. Yet states need not employ these approaches. They can choose any approach, taking advantage of changing market conditions, new information, and cost-saving innovations to comply at least cost.

The plan also allows for across-state flexibility in terms of where required emissions reductions occur. Across-state coordination has important cost implications because low-cost abatement options are not evenly distributed across states. Emissions trading is one approach to coordinating emissions abatement cost-effectively across states. Under the proposed plan, states can file multistate implementation plans that allow electricity producers in one state to trade emissions reduction obligations with producers in other states. Plants facing relatively high costs of emission reductions could pay plants with relatively low costs to take on additional emissions reductions on their behalf. Experience in the United States with emissions trading systems has demonstrated that this kind of flexibility within and across states can substantially lower the costs of reducing emissions overall (*4*).

> ***"a state ... could potentially meet the EPA's requirement without lowering emissions"***

Even if states do not pursue emissions trading, effective interstate coordination on implementation within regional electricity markets will be critical. Electricity production is linked and dispatched through regional grid interconnections that span multiple states. Electricity will be traded among states within a regional power system regardless of whether the states choose to trade emissions. Without interstate coordination, technologically identical power plants located in different states—yet servicing the same electricity customers—could face very different regulatory incentives and operating costs. Such differences would distort the flow of electricity between states and raise the overall cost per ton of emissions reduced under the plan.

At a minimum, states within the same electricity interconnection should coordinate to implement the plan in a way that harmonizes emissions reduction incentives across states. Although coordination of state implementation is certainly possible under the proposed plan, it is by no means guaranteed. The EPA can promote coordination by issuing specific guidelines—"model rules"—in the revised plan that states seeking to coordinate can adopt. The EPA has assumed this coordinating role in past programs to reduce administrative difficulties that impede coordination across state boundaries. Under the proposed plan, the EPA will also need to consider how coordination among states can be achieved between rate-based and mass-based approaches to compliance.

KEY ISSUES GOING FORWARD. The Clean Power Plan is the centerpiece of the Obama Administration's Climate Action Plan. The proposed reductions in power sector emissions may take on strategic importance in an international setting, where other countries are looking to the United States to gauge their own commitments to reduce emissions as part of the next international agreement.

Two concerns need to be addressed regarding the ratio-based approach to defining emissions reduction targets. The first is perverse incentives for expanded electricity production in place of reduced emissions. The second is potential overestimation of energy efficiency gains that will effectively weaken the standard. The plan would also benefit from EPA guidance as to how states will be permitted to convert ratio-based targets into mass-based approaches.

The plan's considerable flexibility regarding how and where emission reductions can occur is an important feature because it promotes cost-effectiveness. Whether states will fully capitalize on this flexibility is an open question. Effective coordination among states and within multistate power markets will require state governments to overcome considerable analytical, logistical, and administrative hurdles. As part of the final rule, the EPA can play a facilitating role by providing additional and more concrete guidance on how states choosing to harmonize their implementation plans and/or compliance obligations can do so efficiently. These considerations are critical to meeting emissions reduction goals at the least cost. ■

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