



Evaluating the Effectiveness of U.S. State Policies to Reduce Carbon Dioxide Emissions from Power Plants

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Power plants are currently the nation's largest source of greenhouse gas emissions – especially the dangerous carbon emissions known to increase global warming. In June 2014, President Obama proposed the Clean Power Plan, which will require states to reduce carbon pollution from power plants, cutting emissions to 30 percent of 2005 levels by 2030. The Environmental Protection Agency in Washington DC will oversee the implementation of the Clean Power Plan, but its ultimate success depends on the fifty U.S. states. Each state must adopt and enforce effective carbon pollution reduction measures for its own electricity sector.

Fortunately, states have already tried a variety of strategies to reduce emissions over the past two decades, so policymakers can learn from past successes and failures as they respond to the new Clean Energy Plan. Our research aims to aid such learning.

Previous State Policies

State efforts to reduce harmful emissions have relied on both direct and indirect approaches.

- In the most direct approaches, states keep track of emissions and require reductions to specific levels by a certain date. Measures such as emissions caps, greenhouse gas targets, climate action plans, and greenhouse gas registries have been deployed to such ends.
- Other state programs indirectly helpful to the climate focus on the energy sector as a whole, aiming to reduce emissions and strengthen incentives for energy efficiency. Renewable portfolio standards, efficiency targets, and public investment funds may be used. Another approach involves “decoupling” the profits earned by energy companies from the sheer volume of electricity generated and sold. The aim is to make sure that reductions in electric energy do not lead to lower profits.

Some measures are much more prevalent than others. Most U.S. states have established some type of climate action plan, but just a handful have turned to decoupling policies. What is more, state-level policies have been in effect for various periods, providing more or less time for their effects to become evident.

Which State Policies are Most Effective?

In 2010 the U.S. Environmental Protection Agency began requiring power plants to provide information on their emissions under the Greenhouse Gas Reporting Program. Our research uses this information along with data about the various direct and indirect climate measures adopted by the states and when they were adopted. By combining all this information, we are able to analyze the effectiveness of various kinds of state policies for decreasing emissions from specific power plants. If the ultimate goal is reducing greenhouse gas pollution, which policies do more to achieve that end when we track changes in plant-level emissions? Our research offers preliminary answers.

- Climate action plans and greenhouse gas registries, the two most widely used state-level policies, have no significant effect on plant-level carbon emissions.

- Plant-level emissions are not reduced by laws that encourage more efficient energy generation and transmission or by portfolio laws that set quotas for electricity to be produced by renewable or alternative sources.
- Plant-level greenhouse emissions have been reduced by caps and targets that set specific reduction goals – in states where such policies have been in place for at least five years.
- Public benefit funds – which invest in research and development for energy efficiency and renewable power – have also been effective at decreasing emissions from power plants.
- Plant-level reductions in dangerous emissions have happened in states with decoupling programs that cut the link between energy revenues and electricity sales volume.

What explains variation in the effectiveness of policies for reducing carbon pollution? Some policies adopted by the states may have been ineffective because they are too vague or insufficiently publicized and enforced. More successful policies tend to have specific, concrete goals that can be objectively measured. Both emissions caps and greenhouse gas targets set goals that give states and plants clear guidelines about what they need to achieve. Approaches that rely on economic incentives can also be effective. For example, the relative success of public benefit funds and decoupling programs suggest that utilities may be more likely to invest in clean energy when they can make more money by selling less electricity.

Of course, it is important to acknowledge that emission levels are influenced by the characteristics of power plants themselves, as well as by state policies. On average, plants that are older or rely primarily on coal for fuel have significantly higher emissions. In contrast, lower emissions on average occur at plants with independent system operators and at plants that are part of regional transmission organizations where energy transfers are more efficient.

The Value of Bottom-Up Programs to Reduce Emissions

In recent years, national governments and international organizations have struggled to address climate change through legislation or regulations to reduce greenhouse gas emissions. Meanwhile – especially in the United States – states and other sub-national actors have launched major new initiatives that have shown considerable success in curbing electricity-based carbon pollution. The record of policy accomplishments in the U.S. states underlines the promise of decentralized strategies like the Obama administration's new Clean Power Plan – and suggests that Americans determined to reduce dangerous carbon emissions without waiting for Congressional gridlock to lift may be wise to ramp up bottom-up approaches.

Read more in Don Grant, Kelly Bergstrand, and Katrina Running, “Effectiveness of U.S. State Policies in Reducing CO₂ Emissions from Power Plants.” *Nature Climate Change* 4 (October 2014).