

Renewable energy mandates reduce carbon dioxide emissions—but at a cost

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As states take the lead in confronting climate change, their flagship policy is a program that requires that a certain percentage of the state's electricity come from renewable sources.

But [a new working paper](#) co-authored by University of Chicago scholars found that these popular programs—enacted in 29 states and the District of Columbia—are inefficient in reducing carbon emissions and come at a high cost to consumers. They found these Renewable Portfolio Standards increased prices by as much as 17 percent, making the policy's cost of reducing carbon emissions more expensive than current estimates of the benefits.

"The increasing urgency of climate challenge means that the case for ruthlessly seeking out the least expensive reductions in carbon emissions is rapidly strengthening," said study co-author Michael Greenstone, the Milton Friedman Distinguished Service Professor in Economics and director of the Energy Policy Institute at the University of Chicago. "This study joins a growing body of evidence that demonstrates that when

climate policies favor particular technologies or target something other than the real enemy—carbon emissions—the result is less effective and more expensive than is necessary. In contrast, the global experiences from carbon markets and taxes make clear that much less expensive ways to reduce CO₂ are available right now."

Greenstone and co-authors Richard McDowell of the Massachusetts Institute of Technology and Ishan Nath from the University of Chicago compared states with and without RPS policies, using the most comprehensive dataset compiled to date. They found that RPS programs, which currently cover 64 percent of the [electricity](#) sold in the United States, significantly increased retail electricity prices—with prices rising by 11 percent seven years after the policy became law and 17 percent 12 years afterward.

The cumulative effect seven years after the passage of the legislation initiating an RPS, consumers in the 29 states studied had paid \$125.2 billion more for electricity than they would have in the absence of the policy.

On the other side of the ledger, RPS programs increase renewable generation. In states with RPS policies, renewables' mandated share of generation increased by about 1.8 percentage points seven years after passage, and 4.2 percentage points 12 years afterward. The paper estimates that this increased renewable generation reduced the carbon intensity (i.e., carbon emissions per unit of electricity) of these state's electricity generation and, in turn, their carbon dioxide emissions.

However, these reduced emissions came at a high cost. The study found that the cost of abating [carbon emissions](#) through an RPS policy is more than \$130 per metric ton of CO₂ abated, and as much as \$460 per metric ton. This is several times higher than conventional estimates of the benefits of reducing a metric ton of CO₂ emissions, a

measure known as the social cost of [carbon](#). The Obama Administration's central estimate of the SCC would be approximately \$50 per ton in today's dollars. A second point of comparison comes from the cost of abating a metric ton of CO₂ in current cap-and-trade markets in the US: it is about \$5 in the northeast's Regional Greenhouse Gas Initiative and \$15 in California's cap-and-trade system.

The study explains that RPS policies raise electricity prices more than previously thought, because several hidden [costs](#) have typically been ignored: 1) The intermittent nature of renewables means that back-up capacity must be added; 2) since [renewable sources](#) take up a lot of physical space, are geographically dispersed and are frequently located away from population centers, they require the addition of substantial transmission infrastructure; and 3) by mandating an increase in renewable power, baseload generation is prematurely displaced, and some of the cost is passed to consumers.

Provided by University of Chicago

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