Cap and Trade Curbed Acid Rain: 7 Reasons Why It Can Do The Same For Climate Change

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A recent Harvard report reflects on the success of the SO2 allowance-trading program used to curb acid rain. The authors note that "cap and trade" seems especially well suited to addressing the problem of climate change." Credit: PNNL

A candidate for president emphasizes the environment on the campaign trail. He promises to update the Clean Air Act to address a grave and growing pollution threat. He wins. Three weeks after taking office, he addresses a joint session of Congress. "The time for study alone has passed, and the time for action is now," he declares.

If you guessed climate change was the threat and Bill Clinton or Barack Obama the speaker, guess again. The new president was George H.W. Bush, and the grave and growing threat was acid rain. Five months after uttering those words, the Bush administration sent Congress a bill that amended the Clean Air Act (CAA). Included was the architecture for the world's first large-scale application of cap and trade to control pollution, an allowance-trading system for sulfur dioxide (SO_2), the major contributor to acid rain. Bush signed the bill into law in November 1990.

A new report ["The SO_2 Allowance Trading System and the Clean Air Act Amendments of 1990: Reflections on Twenty Years of Policy Innovation from the Harvard Environmental Economics Program, recounts this remarkable story. More important for climate policy, the report distills what policy-makers have learned 20 years after launching a market for SO_2.

In May of 2011, Harvard hosted a two-day workshop, inviting economists, lawyers, and former government officials, including several who served in the H.W. Bush White House, to reflect on the performance of the SO_2 trading program. Participants included Harvard's Robert Stavins (co-author of the SO_2 allowance-trading report) as well as Robert Grady, a senior official at the Office of Management and Budget under President Bush I; C. Boyden Gray, the elder Bush's White House Counsel; Fred Krupp, President, Environmental Defense Fund; and Mary Nichols, a Clinton administration EPA official now overseeing the development of California's soon-to-launch carbon-trading program.

If and when Republicans (and, to be fair, some coal- and oil-state Democrats) in Congress are ready to join the political fight to prevent runaway climate change, here are seven lessons learned from the cap and trade program deployed to tackle acid rain:

1) Cap and trade works:

The goal of Title IV of the Clean Air Act amendments of 1990, the Acid Rain Program, was to slash annual SO_2 emissions by 10 million tons from the 1980 baseline (26 million tons). The source of much of the SO_2 emitted in the United States was the nation's fleet of coal-fired power plants. In a departure from convention, the legislation did not prescribe *how* power plants should slash SO_2; instead, beginning in 2000, the statute capped aggregate SO_2 emissions at the nation's 3,200 coal plants at 8.95 million tons annually, a reduction of nearly 50% from 1980 levels.

At the outset, the government freely allocated (a political concession, which I'll get to below) allowances (each unit represented a ton of SO_2) to power plants. Utilities then decided how to operate under the cap, from the report:

If annual emissions at a regulated facility exceeded the allowances allocated to that facility, the facility owner could either buy allowances or reduce emissions, whether by installing pollution controls, changing the mix of fuels used to operate the facility, or by scaling back operations. If emissions at a regulated facility were reduced below its allowance allocation, the facility owner could sell the extra allowances or bank them for future use; these opportunities created incentives to find ways to reduce emissions at the lowest cost. (p.12)

Between 1990 and 2004, SO_2 emissions from the power sector fell 36%, even as output from coal-fired power plants increased by 25% over the same period. The 8.95 million ton cap was reached in 2007. In 2010, by which time the cap and trade system had been augmented by the George W. Bush administration's Clean Air Interstate Rule, SO_2 emissions had fallen to 5.1 million tons.

2) Carbon trading is likely to cost less than expected:

Research presented at the May 2011 workshop showed that choosing a cap and trade program for SO_2 resulted in a range of 15% - 90% savings compared to the alternatives, such as policies that might have pre-selected a preferred pollution-control technology. In 1990, the EPA had estimated that implementing the Acid Rain Program (with SO_2 allowance trading) would cost $6.1 billion. By 1998, the Electric Power Research Institute, an industry-funded research organization, estimated total implementation costs at $1.7 billion; Resources for the Future's estimate the same year was even lower, $1.1 billion.

3) Lawmakers will likely underestimate the environmental benefits:

The H.W. Bush administration and Congress took action to reduce SO_2 emissions because of the acidification of lakes and streams and destruction of forests in the Northeast and Canada. A serendipitous supplementary benefit, however, were the positive implications for public health. The health benefits linked to reduced levels of particulates from lower SO_2 emissions were estimated at $50 billion *annually* by 2010.

As routinely happens, policy-makers focused on the costs, and underestimated the benefits, of environmental protection:

Analysts failed to foresee either lower-than-expected abatement costs or the substantial human health benefits of reducing fine particulate pollution, which also originates from SO_2 emissions. **Had those lower costs and added benefits been fully appreciated, policy makers might have pursued an even lower SO_2 cap**. (p. 21) (emphasis added)

4) Constrained by a cap, emitters will innovate:

In their 1990 update to the CAA, Congress chose neither to set uniform emission limits for power plants nor to mandate the pollution-control technology to be installed. Lawmakers believed that utilities, forced to internalize the cost of waste previously emitted for free, would devise creative ways to cut SO_2 emissions – which they did, pushed by the cap.

The report explains:

The greater flexibility of a market-based approach provides greater latitude for regulated entities to pursue compliance strategies that might not have been anticipated by policy makers at the outset of the program. Second … [it] creates continuous incentives for innovation, since each additional ton of reduction that can be achieved for less than the market price of an allowance creates value for the entity that produces those reductions. (p. 31 and 32)

Utilities did install scrubbers, the prevailing pollution-control technology for SO_2 (more than half of currently installed scrubbers came online after the 1990 CAA), and they did so largely because of the cap. "The high cost of these systems could only be justified in expectation of non-trivial SO_2 allowance prices," the authors write. Scrubber performance subsequently improved, and the costs to operate them declined, over the past 20 years.

In some cases, utilities were able to avoid installing scrubbers altogether. The spread of new mining techniques increased the availability of low-sulfur coal. Utilities switched to low-sulfur coal, or blended it with high-sulfur coal. The latter disproved the prevailing notion that existing boilers could not accommodate significant fuel blending. "Clearly, fuel switching would not have evolved to become a significant compliance option had the government pursued a more prescriptive regulatory policy that required all emissions sources to install add-on controls," the authors write.

5) Regional disparities can be overcome:

One obstacle lawmakers had to overcome was the reality that many of the nation's most-polluting coal-fired power plants were clustered in the East and Midwest. Wouldn't ratepayers in those states be disproportionately impacted by the costs utilities were projected to incur under the SO_2 cap and trade scheme? (This question returned when the House debated the Waxman-Markey climate bill in 2009.)

No, as it turned out:

The SO_2 allowance-trading system on the whole did not produce substantial rate differentials across regions, in part because overall compliance costs ended up being quite low, but also because coal hardly ever sets the electricity price in competitive markets. As a result, the effect of the program on marginal electricity prices was small. (p. 29)

6) A political battle is inevitable, it can be won, but victory requires presidential leadership:

Viewed through the prism of today's noxious post-truth politics, the votes that secured passage of the CAA amendments of 1990 seem a paragon of bipartisanship. The final bill passed the House by a vote of 401-21; the Senate, 89-11. That's not to say that the path to those votes was smooth, or the outcome assured.

Then-Senate Majority Leader Robert Byrd (one of those coal-state Democrats) had held up acid-rain legislation for years. And even though Byrd's successor, George Mitchell, represented Maine, one of the states most affected by acid rain, he commanded neither a filibuster-proof majority nor a united caucus.

From the report:

The politics of the electric power industry was divided more along regional lines than along party or ideological lines, with coal-intensive districts in the Midwest concerned about stranded capital investments and districts in the West apprehensive of applying differential regulatory treatment to new and existing capital. (p. 36 and 37)

Now I return to those freely allocated SO_2 allowances. Leaders in Congress and the H.W. Bush administration believed that the free allocation of allowances was necessary to win over fence-sitting members of Congress, particularly those from the Midwest:

Members of Congress fought intensely to increase the share of freely allocated allowances that would go to utilities in their home districts, as a means to sell the SO_2 allowance-trading program to constituents. This general principle allowed for considerable political horse-trading at the margin, however—that is, awarding a few more allowances to a particular plant in a particular district while maintaining the total cap—to win support for the overall policy. (p. 27)

Reluctant lawmakers also knew that the SO_2 cap and trade program was supported by the White House. Advisers Robert Grady and C. Boyden Gray were deeply involved with drafting the plan, and, as noted above, the elder Bush pledged to address acid rain during the 1988 campaign. When forced to decide how deeply to cut SO_2, Bush chose the most aggressive course:

The Bush team eventually chose a ten million ton reduction policy, which was **the most ambitious of the three options presented to the President** by the Domestic Policy Council at the time, according to workshop participants. (The other options proposed targeted reductions of six and eight million tons.) This **ten-million-ton option presented marketing opportunities**: It was a double-digit number, and it represented a 50 percent reduction in emissions, both of which signified that Bush was serious about pollution reductions. (p. 22) (emphasis added)

Bush not only chose the most ambitious alternative, he did so explicitly because it was thought to be smart politically.

7) Cap and trade and CO_2 are meant for each other:

The authors of the Harvard study observe, before reflecting on the acrimony of the Waxman-Markey bill debate, that cap and trade is likely more appropriate for carbon than it is for SO_2:

Ironically, cap and trade seems especially well suited to addressing the problem of climate change, in that emitted greenhouse gases are evenly distributed throughout the world's atmosphere. Recent hostility toward cap and trade in debates about U.S. climate legislation may reflect the broader political environment of the climate debate more than the substantive merits of market-based regulation. (p. 5)

The report authors argue that it is unlikely Congress or the H.W. Bush administration would have supported a 10-million-ton reduction in SO_2 without the cap and trade mechanism in place.

Summing up the views of the Harvard workshop participants, they write:

The program, while not without flaws, is viewed as a success by almost all measures. Certainly it demonstrated that broad-based cap-and-trade systems can be used to achieve significant emissions reductions, that firms can navigate and regulators can enforce the compliance requirements of such systems, and that giving the private sector the flexibility to pursue a range of abatement options can simultaneously protect the environment, stimulate innovation and diffusion, and reduce aggregate costs. (p. 39)