CLEARING THE AIR

How Market-Based Policies Help Meet the Tighter US Ozone Limit

The recently strengthened limit for ground-level ozone has stirred controversy over costs, but many existing policies can help states achieve the new standard at a relatively low cost.

Alan J. Krupnick, Joshua Linn, and Kristen McCormack

High concentrations of ground-level ozone, commonly known as smog, pose serious threats to a large and diverse swath of the US population, causing asthma attacks and other respiratory problems and leading to premature mortality. Approximately 123 million people, or 40 percent of the population, live in areas with ozone levels that exceed the standard set by the US Environmental Protection Agency (EPA) that had been in effect since 2008. Now the agency has lowered the limit further, from 75 parts per billion (ppb) to 70 ppb, citing adverse health effects that occur at levels lower than the previous limit.

The costs of meeting pollution standards have always been contentious, and the case of ozone is no exception. Estimates of the costs of the new limits on the US economy were hotly contested before the rule was finalized. In 2014, EPA proposed a new standard in the range of 65 to 70 ppb and estimated that the national costs of reaching 65 ppb in 2025 relative to the then-existing 75 ppb standard would be $15 billion (2011$), with benefits 1.3 to 2.5 times greater than costs. (These estimates exclude California, which will have longer to comply with the standard.) In stark contrast, industry reports estimated that the direct costs of achieving a 65 ppb standard would amount to between $75 billion and $85 billion in 2025. In the run-up to the final rule, the National Association of Manufacturers led a campaign against tighter ozone standards that claimed cumulative costs over the entire program period would be in excess of one trillion dollars, declaring the proposed tighter standard "the costliest regulation ever."

Most of the cost controversy circled around the differences between how EPA and industry valued the mitigation measures needed to meet the tighter standard. To calculate the cost of the alternative standard, EPA identified and estimated the cost of a set of well-known technologies that could be used to reduce emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs), the two precursors of ground-level ozone. But this set of technologies was not expected to reduce emissions enough to meet the proposed new standards nationwide. To complete its estimate, EPA valued the cost of the remaining unspecified controls that would be needed to meet the proposed standard. Here is where the estimates diverge: EPA valued the cost of these controls (misleadingly termed "unknown") at a much lower level than did critics of the standards.

Our analysis indicates that EPA's cost estimates were likely closer to the mark than industry cost estimates. In part, this is due to the more realistic emissions reductions estimates assumed by EPA. In addition, industry critics have ignored the efficiencies of many market-based policies—such as cap-and-trade programs and gasoline taxes—that can achieve emissions reductions at relatively low cost.

EPA announced the new standard of 70 ppb in October 2015. It estimates that an additional 18 counties are expected to violate the new standard, and some of these counties exist in states that have not previously been required to develop implementation plans to comply with the standard. In areas projected to be furthest from meeting the standard, state governments may choose

ALAN J. KRUPNICK is a senior fellow at RFF and co-director of RFF's Center for Energy and Climate Economics.

JOSHUA LINN is a senior fellow at RFF.

KRISTEN McCORMACK is a research assistant at RFF.

to establish tighter controls on key sources of the precursors to ozone. The potential for these policies to span multiple sectors partially explains the heavy advertising and pointed statements arguing against a tighter ozone standard from the American Petroleum Institute and the National Association of Manufacturers. But state and federal policymakers and regulators working on implementation plans for compliance will have many good options from which to choose. In fact, given the high prices for NO_x offsets and concentration of violating counties in California and Texas, it is especially important to explore other policy options that are likely to prove more cost-effective than current abatement methods.

NO_x Cap-and-Trade in the Power Sector

Both EPA and industry critics analyzed potential technology mandates for the power sector, but, in fact, a cap-and-trade program for NO_x emissions has existed since 1999. The program initially covered power plants and large industrial boilers in the Northeast, expanded to the Southeast and Midwest in 2003, and expanded further in 2009 to cover about half the country.

When implemented efficiently, cap-and-trade programs can reduce emissions at lower cost than other measures—installing emissions-reduction technology at all plants, for example, or retiring coal-fired plants. The cost advantage arises from the fact that cap-and-trade programs encourage emitters to find the lowest-cost opportunities for emissions reductions. For example, the cost of installing selective catalytic reduction technology may vary across power plants, and only the lowest-cost plants would install it under a cap-and-trade program. Other plants would find other ways to reduce emissions.

Existing cap-and-trade programs could serve as a model for a national program to help reduce NO_x emissions. Results from the RFF Haiku electricity model suggest that a national program designed to reduce emissions by 420,000 tons could do so at an average cost of $7,100 per ton. These reductions could replace some estimated by EPA to come from the electricity sector and from "unknown" controls—which EPA assumes will cost $15,000 per ton and industry assumes will cost more, ranging upward from $29,000 per ton.

> "Industry critics have ignored the efficiencies of many market-based policies—such as cap-and-trade programs and gasoline taxes—that can achieve emissions reductions at relatively low cost."

Vehicle Retirement Program

A vehicle retirement program that offers individuals money to retire older vehicles would reduce emissions because older vehicles have higher NO_x emissions rates than newer vehicles. A 2013 analysis of the 2009 Cash for Clunkers program, which offered an average subsidy of $4,400 to retire a vehicle and replace it with a new one meeting certain fuel economy requirements, estimates an average cost of reducing NO_x emissions of $31,000 per ton. This estimate

> "The benefits from a higher gasoline tax would reduce the cost per ton of NO_X and VOC emissions reductions; in fact, the cost could even be zero if the tax revenue were used efficiently."

does not take into account the benefits of reducing emissions of greenhouse gases and other pollutants, such as VOCs, and includes a dirtier fleet than would be present in 2025.

The purpose of Cash for Clunkers was to provide economic stimulus during the recession and to improve the fuel economy of the on-road vehicle fleet. Reducing NO_x emissions was not an explicit objective of the policy. In principle, targeting a retirement program at NO_x emissions could reduce emissions at lower cost. For example, rather than providing retirement subsidies based on the fuel economy improvement between the new and retired vehicle as under Cash for Clunkers, the subsidy could be tied to the retired vehicle's NO_x emissions rate and miles traveled to more effectively target high-emitting vehicles.

Fuel Taxes

Vehicle tailpipe standards set limits on grams of NO_x emissions per mile, and states also could reduce emissions by introducing policies to reduce miles traveled. One option is to raise the gasoline tax (and/or diesel tax), which would increase the cost of driving, encourage people to drive less, and provide an incentive to purchase vehicles with higher fuel economy.

To quantify the effects of fuel tax increases, suppose all states increase their gasoline taxes by $0.10 per gallon, an increase that could be justified by non-environmental goals, such as reducing congestion and accidents, as economists Ian Parry and Kenneth Small have suggested in their work. Accounting for changes in future NO_x emissions rates of the on-road vehicle fleet, the tax increase might reduce NO_x emissions in 2025 by 17,000 tons and VOC emissions by 12,000 tons. The tax increase would have other benefits, such as reducing distortionary taxes on labor and capital or avoiding the need for other tax increases. These benefits would reduce the cost per ton of NO_x and VOC emissions reductions; in fact, the cost could even be zero if the tax revenue were used efficiently.

California's Transportation Policies

California recently implemented several programs (some of which are funded by revenues from cap-and-trade auction sales) that may reduce NO_x and VOC emissions. Although many of these programs were created with the goal of reducing greenhouse gas emissions, they also may serve as examples of policies that states can adopt to reduce ozone levels.

Several of these programs focus on reducing emissions from vehicles. California's Voluntary Accelerated Vehicle Retirement Program offers $950 to individuals who wish to retire vehicles that failed their last smog check. (Low-income consumers are paid $1,400.) Although the program is also available for vehicles that passed recent smog checks, it is intended to target high-emitting vehicles. As another example, the Clean Vehicle Rebate Project encourages the purchase or lease of electric, hybrid, and

fuel-cell vehicles by offering up to $4,800 in rebates per vehicle.

With the passage of California's Senate Bill (SB) 962, 60 percent of future auction revenue from the state's cap-and-trade program has been designated for transportation and sustainable communities programs. These funds support the development of a high-speed rail system, clean vehicle programs, and the expansion of public transit and affordable housing projects, among other goals. In addition, California recently passed a law, SB 350, that is expected to reduce ozone-causing emissions by increasing the use of electric vehicles. By encouraging the use of alternative forms of transportation, these programs and others (such as SB 375, which targets land use) are expected to reduce vehicle miles traveled and NO_x emissions.

Looking Ahead

Existing science suggests that reducing ozone levels will improve public health and the environment. EPA estimates that the benefits expected under the tighter standard will exceed the costs. As outlined here, many cost-effective policy options outside the electric power sector could help states achieve compliance under the new limit at relatively low cost. Additionally, EPA finalized tighter standards for methane emissions last year—a change that will reduce VOC emissions and therefore help reduce ozone levels across the United States.

In considering the costs of meeting the new standard, it is important to also keep technological progress in mind. In its benefit–cost analysis, EPA notes that past regulations have preceded substantial and largely unanticipated technological progress, particularly when the regulations provided strong incentives for innovation. Such unanticipated innovation could cause actual costs to be lower than current estimates.

Beyond domestic policy measures, a discussion of ozone levels in the United States would not be complete without a note about China. China contributes to the US ozone problem by emitting pollution that ultimately crosses the Pacific, so it could be a costless part of the solution if the Chinese government follows through on its pledges to reduce urban air pollution. Its carbon cap-and-trade program, for example, would also reduce NO_x emissions.

Finally, as it has with previous air quality standards, EPA may introduce national programs to help states achieve compliance with the new ozone standard. A nationwide approach that reduces NO_x emissions may be necessary because emissions can travel across state boundaries. Control measures taken by upwind states may translate, in fact, to emissions reductions in downwind states. Helping to facilitate a national emissions trading program and tightening tailpipe standards are just two ways that EPA could support the states toward reaching the ultimate goal of improved health outcomes from lower ozone levels. ●

FURTHER READING

Krupnick, Alan J., Joshua Linn, and Kristen McCormack. 2015. Defining the Unknown: A Look at the Cost of Tighter Ozone Standards. Issue brief 15-03, Washington, DC: RFF.

Parry, Ian W.H., and Kenneth A. Small. 2005. Does Britain or the United States Have the Right Gasoline Tax? *American Economic Review* 95(4): 1276–1289.