Enforcement of the Clean Air Act Amendments of 1990

Testimony Prepared for Presentation to
Subcommittees on Oversight and Investigations and
On Health and the Environment
Committee on Commerce
U.S. House of Representatives
November 9, 1995

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Mr. Chairman and distinguished committee members. Thank you for inviting me to testify on implementation and enforcement provisions of Title I of the Clean Air Act Amendments of 1990 (1990 CAAA). I am pleased to provide you with my ideas and judgments on the issues, from my perspective as a professional environmental economist, based on fourteen years of experience at Resources for the Future (RFF), many of them spent on issues associated with the Clean Air Act and with cost-benefit analysis. RFF is an independent, nonpartisan research and educational organization concerning itself with environmental and natural resource issues. In addition, I have recently served as a senior economist on the Council of Economic Advisers (CEA), with primary responsibility for the environmental and natural resource portfolio. While at CEA, I worked on a number of Clean Air Act issues, including the U.S. Environmental Protection Agency's (EPA) preliminary planning for analyses required to repromulgate the National Ambient Air Quality Standards (NAAQS) for ozone. Also, I currently cochair (with EPA's Office of Air Quality Planning and Standards' Director John Seitz) the Clean Air Act Advisory Committee's newly formed subcommittee on Ozone, Particulate Matter, and Regional Haze Implementation Programs. I want to emphasize that the views I present today are entirely my own.

I will confine my remarks to issues associated with setting and implementing the ambient ozone and particulates (PM10) NAAQS. Both standards are up for court-ordered repromulgation and are at the center of the debate over the costs and benefits of cleaner air.

Moderate Progress on Ozone and PM10

Progress toward achieving national compliance with the ozone and PM10 standards has been moderate and, with ozone, unsteady. Nationally, ozone and PM10 concentrations have fallen 12 percent and 20 percent, respectively, since 1985 (U.S. EPA 1988, 1994). The ozone improvements have been interrupted by four (possibly five) years that showed concentrations and exceedences elevated over the previous year, primarily because of hot summers. The most favorable set of numbers shows a drop from 112 million people to 50 million people living in counties with ozone monitors from 1988 to 1994 (U.S. EPA 1988, 1994; 1990 population data), but the total number living in the 79

Metropolitan Service Areas (MSAs) violating the ozone standard in 1994 is 126 million (U.S. EPA 1995a). The corresponding, most favorable estimates for PM10 are 26 million people in 1988 and 13 million in 1994. PM10 nonattainment areas increased from 70 in 1990 to 82 in 1994 (Freas 1995).

The Rising Costs of Control

According to one recent, albeit preliminary, estimate (Portney and Harrington 1995), the United States spent about $13 billion in 1994 for controls of ozone precursors. Because the 1990 CAAA ratchets up the requirements for noncomplying states toward the end of the century, by the year 2000 annual spending on ozone control may approach $25 billion. Even this level of spending will leave many areas of the country in violation of the current standard.

These gross estimates of spending mask a series of mini-dramas involving the cost and effectiveness of controls mandated under the CAAA for meeting ozone standards. First, enhanced inspection and maintenance programs were to be introduced into areas that the CAAA defined as "serious" or worse, with these programs featuring use of complex technologies with high costs, questionable benefits, and waiver limits for vehicle repair costs raised to $450 (from about $50 in most state programs). Amid a howl of protests about the program, EPA withdrew the rule and permitted states to take their own approach, so long as they could meet certain performance criteria. Second, employer trip reduction programs were to be introduced into the areas classified as "extreme," while areas with less significant problems were discussing opting into the program. Such programs were greeted with much resistance because of their costs and questionable effectiveness. Here again EPA withdrew the relevant rules. Finally, areas classified as serious or worse were required to introduce a clean-fuels program. The EPA promulgated a rule that favored gasoline with an ethanol additive, but the rule was thrown out of court on due process grounds (not because of costs). All in all, not an enviable record to date.

The Rising Administrative Burden

As amended in 1977 and 1990, the Clean Air Act of 1970 requires EPA to set national ambient air quality standards and sets up a state planning process (called a state implementation plan, or SIP) to ensure attainment. Until the 1990 Amendments, states were required to demonstrate that their plans would lead to attainment of the standards by the deadline and show "reasonable further progress" in reducing emissions of ozone precursors. The 1990 Amendments made this process both more complex (as laid out in Subpart 2 of the act) and more burdensome by requiring that nonattainment areas be subcategorized into five types of areas ("marginal" and "moderate," in addition to "serious," "severe," and "extreme" as noted above) and by placing specific and unique requirements on such areas to help bring them into attainment.

The Looming Crisis

Based on previous interpretations of standard-setting criteria, the clinical and epidemiological record, and recent reports from EPA, it is possible that the ambient ozone standard will be tightened and its averaging time lengthened—from a one-hour daily maximum reading of 0.12 parts per million (ppm) (with one exceedence per year allowed over three years) to an eight-hour daily maximum of 0.08 ppm with perhaps multiple annual allowable exceedences. This outcome could double the number of counties classified as being in nonattainment and all but end the hopes of many noncomplying areas to attain.

At the same time, the evidence for health effects below the PM10 standards is pervasive, although significant questions remain to be resolved. Moreover, it is possible that a new, fine particle standard will be set at stringent levels, again throwing many areas into nonattainment and causing significant alterations in state implementation plans for PM10.

A Six-Step Recovery Plan

Twelve-step recovery plans are currently the vogue for getting one's own life in order when one's situation is dire. Fortunately, our problems with air pollution control policy are not nearly as bad as that. Thus, I offer a more modest, six-step recovery plan—for EPA, Congress, and the public—to help get air pollution policy as addressed in Title I on track.

1. Acknowledge mistakes and adapt to new knowledge. The first step toward recovery is to acknowledge mistakes as well as the changing circumstances that can make old habits inappropriate. In writing the 1990 CAAA and in carrying them out, Congress and EPA based their actions on several assumptions that now appear to be false. In fairness to both, scientific understanding in some of these areas recently has improved and been clarified; in some cases, EPA is taking steps to adjust its program in light of some of the new understandings. Among the questionable assumptions are the following:

The NAAQS can be set to protect health with a margin of safety and can be set without regard to costs. The notion of protecting public health with a margin of safety requires logically that there be "bright lines" below which no effects from pollution exposure are observed. Epidemiological and clinical studies find health effects below current standards for ozone and PM10, with no indication that such "bright lines" exists. EPA acknowledges that such lines may not exist (as did Edmund Muskie when he helped write the 1970 CAA). Yet, without such lines and excluding any notion of balancing the gains with the pains, there is no other logic for stopping short of complete health protection. As EPA's rationale admits to incomplete protection, costs implicitly must be playing a role. This role should be made explicit.

Health benefits are huge relative to the costs of controlling both ozone and PM10, and ozone is the bigger problem. In fact, based on the *quantitative* epidemiological and

clinical evidence, as well as on studies that gauge the preferences of individuals (expressed in dollar terms) for avoiding various types of health effects, the benefits of small additional improvements in ozone reductions may be pretty small while those for PM10 control may be far larger (see note 1). Yet ozone has been EPA's primary focus. Of course, there are many uncertainties in both the health and economics literatures that could swing these findings around. On the one hand, cumulative, low-level exposures to ozone may result in significant irreversible lung damage; on the other, the strong associations between PM10 exposures and mortality may be artifacts of still-hidden factors, or the lives of seriously ill people may, for the most part, only be cut short for a few days by high PM10 episodes.

The "secondary" effects of ozone and PM10 can be addressed by secondary standards. In fact, effects of PM10 constituents and ozone precursors on visibility, crops, forests, lakes, and so on are regional problems related as much to urban emissions addressed under the primary NAAQS as to rural emissions. Studies of the preferences people hold for avoiding such effects question whether they deserve second-class status to some types of health effects.

Ozone and PM10 problems are local. A vast amount of energy is expended on developing localized, urban pollution-control strategies through the SIP process. Yet, there is now widespread consensus that ozone and PM10 are generally regional problems (not limited to the Ozone Transport Commission region) and that localities on their own cannot, in some cases *ever,* come into attainment with the current (much less a tighter) standard for ozone. The idea of attainment and nonattainment areas simply doesn't fit.

Pollutant problems are separable. We set standards and develop implementation plans that regulate PM10, ozone, nitrogen oxides (NO_x), and sulfur dioxide (SO_2) separately. But NO_x and, to a lesser extent, volatile organic compounds (VOCs) are constituents of PM10 and precursors to ozone. SO_2 (as sulfates) is a constituent of PM10.

Reducing emissions reduces harm. What could be more commonsensical than this assumption? Yet, in certain circumstances, increasing NO_x emissions can reduce ozone concentrations over significant areas; reducing SO_2 emissions can increase nitrate concentrations (which are counted as PM10); and reducing NO_x emissions can increase sulfate concentrations (which are counted as PM10). Increasing sulfates can reduce global temperatures. Reducing ozone may increase UV-B exposures, which may result in increased risk of cancer and cataracts (Lutter and Wolz 1995). Thus, the appropriate mix of emissions changes to reduce overall health risks is not clear.

Emissions-reducing technologies are preferred. The cornerstone of our approach to mobile source pollution problems is technology to abate emissions: tighter tailpipe and new evaporative emissions standards, diesel emissions controls, alternative fuel and vehicle mandates in California, the 49-state car in the Ozone Transport Region, and enhanced inspection and maintenance programs (I&M). At the same time, increasing vehicle miles traveled (VMTs) and congestion threaten to erode much of the potential gains. And the costs of new technologies, as well as mounting public resistance, already are leading to pullbacks in these initiatives. Thus, we need to think about alternative

approaches—coupling new emissions monitoring technologies to I&M or economic incentive approaches, for instance (see below).

Command-and-control policies are preferred. EPA has been making real strides to develop and encourage implementation of economic-incentive approaches to emissions control. Nevertheless, the old culture dies hard, as seen in employer mandates under the employer commute option.

We (the general public) are not responsible for air pollution problems. The general public wants cleaner air but doesn't believe that mundane actions like driving one's reasonably well-tuned car contribute to the problem, and even in Los Angeles, the public appears unwilling to make the additional lifestyle sacrifices required to bring mobile source emissions down.

2. Rehabilitate EPA's Title I Program. Short of modifying the Clean Air Act, there is much that EPA can do to improve the way the ozone and PM10 NAAQS are implemented. Some examples include:

Alter the approach to determine allowable exceedences. The current policy to permit one day each year on which the ozone standard is exceeded is a judgment call to balance the effect of changeable weather and economic conditions with the need for health protection. However, given the highly skewed nature of air pollution readings, even a minor change in the number of allowable exceedences could result in huge cost savings. With as few as three exceedences allowed per year, based on 1995 data, 44 of the 79 MSAs currently violating the ozone standard would be in compliance. If the health significance of these relaxations would be minor (and we suspect it would be), the cost savings would be great.

Several options to put the determination of allowable exceedences on a more analytical footing include (i) defining an allowable exceedence in terms of a multiday episode rather than a single-day episode; (ii) excluding certain types of unusual weather conditions from the count, an approach that permits allowable exceedences to differ across the areas; (iii) balancing benefits and costs—allowing additional exceedences if the cost savings are disproportionately large compared to the expected health damages. (For a cost-benefit analysis of ozone reductions, see Krupnick and Portney 1991.)

Average monitor readings. Currently, if one monitor records an exceedence, it counts as an exceedence for the entire area, even if few people live near the monitor and even if other monitors show readings far below the standard. Averaging concentrations over monitors is one option for dealing with this peculiarity in the present approach. However, weighting the monitored readings by population would provide a truer picture of the health consequences of exceedences.

De-emphasize air quality modeling in the planning process. Designing SIPs has become a numbers game involving counting up EPA credits for emissions reductions and running air quality models to demonstrate that a particular set of strategies brings every area of a region into attainment over the set of most of the expected weather conditions.

None of the steps in this game are exact enough to warrant rejecting plans and ultimately levying sanctions. By "working to the numbers," good ideas may be rejected because they don't perform so well with the models being used. Minor procedural reforms could make a big difference, such as allowing use of average or typical weather patterns in the air modeling exercise rather than extreme events and also judging plans to be acceptable if they bring most parts of an area into attainment.

Move towards a performance basis for evaluating state programs. One major change would be to gauge attainment strategies on the performance of the local area alone, netting out the effect of imports of pollutants from other regions while, symmetrically, counting the effects the local area has on downwind areas.

Another change would be to base plan compliance on "weather-adjusted" conditions. Chock and Nance (1993) point out that weather variability makes the effective ozone standard far tighter than it seems. For San Francisco to be reasonably certain of staying in attainment with the ozone standard, it needs to design its program to bring the second highest daily peak over the year down to 0.06 ppm.

Another, even more radical change would be to base performance assessment more on risk reductions than on concentration reductions. The interactions among pollutants and the fact that increases in emissions can *reduce* concentrations of some pollutants opens up many interesting and potentially cost-effective strategies for reducing health risks while trading off decreases in emissions of one pollutant with increases in another.

3. Build on the best ideas. Congress, EPA, and the states have initiatives worth saving. In fact, more ideas for reform are in circulation than ever before. Some of the best include:

Revive the "too close to call" category for nonattainment areas. Before the 1990 CAAA, EPA used a "too close to call" nonattainment category with minimal requirements for areas just violating the NAAQS. Areas in this category (with "design values" up to 0.14 ppm) were not subject to full SIP requirements, but were watched closely to see if their air quality was getting worse. Given the spatial and temporal variability in concentrations as a result of weather and the strict requirements for demonstrating compliance, this category should be revived. It may take a change in the Clean Air Act or new standards to do this.

Pursue current institutional/partnership initiatives with vigor. Several recent initiatives—the formation of the Ozone Transportation Commission (OTC) (under the 1990 CAAA), the Ozone Transport Assessment Group (OTAG), and the Clean Air Act Advisory Committee's (CAAAC) Subcommittee for Ozone, Particulate Matter, and Regional Haze Implementation Programs—are on the right track.

The realization that long-range transport of ozone and its precursors was hindering the ability of cities along the East Coast to comply with the ozone NAAQS led to the creation of the Ozone Transport Commission for the Northeast corridor, consisting of the states of New England plus Pennsylvania and New Jersey. The OTC represents a

partial, first attempt at "internalizing the regional externalities," as economists would awkwardly say, associated with pollution in airsheds covering hundreds or even thousands of miles. However, major stationary sources of NO_x in the northeastern United States are in West Virginia and the Midwest. In addition, multijurisdictional problems are not confined to the Northeast. Approaches that encompass an entire airshed are likely to be both more effective and less costly, although implementation will be challenging.

The CAAAC subcommittee addresses the complications of pollutant interactions and spatially overlapping effects, its purpose being to develop integrated approaches to the ozone and PM10 nonattainment problems, as well as regional haze. OTAG takes a piece of this problem to treat in depth: to identify eastern U.S. ozone-control strategies.

Expand trading. A culture shift away from command-and-control to emissions trading has taken place at EPA, as evidenced by EPA's embrace of SO_2 allowance trading the agency's Open Market Trading Rule (U.S. EPA 1995b), and its support for NO_x trading in the Northeast. Still, if the benefits of trading programs for Title I pollutants are to be realized, EPA must become less environmentally risk-averse and consider allowing credits for shutdowns and unlimited banking, as well as making other changes that will facilitate trading market operation.

Develop and expand demonstration programs for economic incentives. Projects such as EPA's XL are demonstrating how the agency is preparing to consider significant innovations to traditional pollutant-by-pollutant, command-and-control regulations of stationary sources. The agency needs to expand these efforts and put much more effort into developing economic incentive programs for mobile sources. An idea that obtained broad stakeholder support in the recently completed White House initiative (the Policy Dialogue Advisory Committee to Develop Options for Reducing Greenhouse Gas Emissions from Personal Motor Vehicles, better known as "car talk") includes VMT-based registration fees, which would involve converting existing registration fees to mileage-based charges, a strategy that can be revenue neutral on average while increasing the marginal cost of driving. For addressing NO_x, VOC, and particulate emissions directly, emissions fees hold promise as a cost-effective tool for mobile source emissions reductions and can also be designed for revenue neutrality. (For a summary of the cost-effectiveness of various mobile source control options, see Krupnick 1992 and Harrington, McConnell, and Walls 1995.)

Shift emphasis to monitoring technologies. With 10 percent of the vehicles responsible for 50 percent of vehicle emissions, finding such vehicles and getting them fixed or scrapped should be a major priority. Enhanced I&M is a clumsy and expensive way to do this. New technologies for real-time monitoring of vehicle emissions, including remote and on-board sensing, hold significant promise for cheaply developing in-use emissions information to identify gross polluters for I&M programs and can serve as the foundation for better economic-incentive programs, such as emissions fees, that target actual emissions.

Vigorously pursue episodic control programs for ozone. With the possible exception of Los Angeles, areas classified as violating the ozone standard are actually in compliance the vast majority of the time. The average number of exceedence-days

annually (excluding LA) is 5.2 and the median number is 2.3. Only three areas out of forty-three are out of compliance more than ten days. As most ozone violations are part of multiday episodes, this represents from three to four episodes a year, on average (see note 2).

The skewed temporal distribution of monitored readings is rendered even more dramatic in hourly terms. A very useful study by the American Petroleum Institute examined the number and percentage of monitor-hours (the sum of hours monitored by all monitors in an area) exceeding the ozone standard in twenty-five representative cities during the 1981–85 period (a period without the unusually poor weather conditions of 1987–88). The standard was violated less than one-half of 1 percent of the monitor-hours in each city. Further, in the 1984–85 period, there were no cities showing more than sixty-four hours in violation at the worst monitor. More recently, Baltimore showed thirty-one exceedence-hours in 1994, representing 2.8 percent of total summer hours.

This skewed temporal distribution of violations presents obvious opportunities for episodic controls—strategies and measures to reduce ozone precursors on the few days where conditions warrant. Such controls would involve issuing a public warning in advance of meteorological conditions usually associated with high ozone, which would trigger a set of prearranged modifications to the behavior of ozone emitters. For instance, large stationary sources might cut back or shift output to different hours, produce products with lower emissions (VOCs from spray painting activities vary by the color of the paint), employers might shift to a flexible work schedule to reduce early morning traffic congestion, public transportation costs might be reduced, and so on. Episodic controls could reduce the number of days requiring precursor emissions reductions substantially. With an ideal forecasting system, this number could be reduced from the entire three-month summer season to about the number of days per year with weather conducive to ozone formation.

Efforts to develop episodic control programs are on-going in a number of localities. Some regions, such as Baltimore and Chicago, have worked to develop public-private partnerships to bring about voluntary episodic reductions in emissions of ozone precursors across a broad array of economic sectors. These programs also extend to government agencies and individuals, particularly with respect to transportation choices.

One obstacle to the acceptance of substituting episodic controls for continuous controls on air pollutants is the concern that the former would redistribute rather than reduce the production of the pollutant. However ozone's unique tendency to form in significant concentrations only on days with certain meteorological characteristics makes it the perfect candidate for episodic control. A mix of NO_x and VOCs on a warm, humid, sunny day will likely produce ozone, whereas on a cold, cloudy day it will not. Moving the emission of large quantities of VOCs and NO_x away from the few days per year likely to produce ozone typically will not defer the production of ozone to another time, but rather may prevent its formation altogether.

4. Clarify and change the act. Congress is responsible for many of the current problems in air quality policy. Congress could take a number of steps to modify Title I of the CAA

(or use other vehicles) that would go a long way to support improvements. These steps include some minor changes and some major ones:

Clarify that a change in the current standards invalidates subpart 2 of Title I. If new standards for ozone or PM10 are issued, this interpretation would permit EPA to base its regulations on the much less prescriptive subpart 1, giving the agency and states significant discretion in program design.

Encourage the idea that airsheds, rather than MSAs, should be the organizing spatial principle of the act, as in regional implementation plans (RIPs). Go further than the 1990 CAAA to foster the creation of airshed-wide institutions with enforcement powers to make airshed management a reality.

Consider a two-stage standard-setting process, setting minimum health protection standards in the first stage and requiring that costs and nonhealth benefits be taken explicitly into account in setting tighter standards in the second stage. Permit costs and benefits (both quantifiable and nonquantifiable) to be used to set the number of allowable exceedences.

5. Educate the public. The general public also bears responsibility for some of the problems with our air quality policy. For instance, the emphasis on technology fixes rather than behavioral change—such as that for alternative-fuel vehicles and against VMT or emissions fees or other approaches that would make driving more expensive—can be laid squarely on the shoulders of public sentiment. Education is the only answer to this problem.

6. Fund research. Underlying my testimony is a set of assumptions based on my understanding of the current state of the air quality modeling, clinical and epidemiological science, and economics. Yet, major uncertainties in these areas remain and their resolution may mean major new directions for the air programs. Therefore a strong, directed research effort needs to be devoted to (i) the effect of cumulative exposures to ozone on the human lung and the implications for chronic respiratory disease; (ii) the determination of the types and sizes of particles most affecting health, particularly the effects of road dust; (iii) the extent to which life is shortened by particulate exposure; (iv) the preferences for avoiding various types of health and nonhealth effects related to ozone and PM10 exposures; and (v) the design of publicly acceptable incentive policies.

Conclusion

Congress, EPA, the states, and the general public can all take credit for the successes of Title I of the Clean Air Act. They each must take responsibility for the serious disconnect between the act and the implementing regulations on the one hand and scientific and economic realities on the other. EPA can go a long way to make its programs more efficient and effective without changes in the Clean Air Act; indeed, a

number of its current initiatives show promise. But it must do more. Congress can help, too, by giving EPA the statutory guidance it needs to improve the program. The states need to be willing to push the system and be laboratories of change. And the general public, particularly the driving public, needs to take responsibility for its role in degrading air quality.

Notes

Note 1. For a copy of the table that accompanies this paragraph, contact the author at Resources for the Future. (back to text)

Note 2. Based on 1991–93 nonattainment areas. Areas that had experienced an average of zero exceedences are omitted from the calculation, as is Los Angeles, leaving forty-three out of ninety-one nonattainment areas in the tabulation. The mean *including* areas which had experienced zero exceedences was 2.52 and the median was 0. (back to text)

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