OFFICE OF INSPECTOR GENERAL

*Catalyst for Improving the Environment*

**Evaluation Report**

# EPA and States Not Making Sufficient Progress in Reducing Ozone Precursor Emissions In Some Major Metropolitan Areas

**Report No. 2004-P-00033**

**September 29, 2004**

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**Abbreviations**

| | |
|---|---|
| CAA | Clean Air Act |
| CAAA | 1990 Clean Air Act Amendments |
| DQO | Data Quality Objective |
| EPA | Environmental Protection Agency |
| I&M | Inspection and Maintenance |
| MCD | Milestone Compliance Demonstration |
| NEI | National Emissions Inventory |
| NOx | Nitrogen Oxide |
| OAQPS | Office of Air Quality Planning and Standards |
| OIG | Office of Inspector General |
| PAMS | Photochemical Assessment Monitoring Station |
| PEI | Periodic Emissions Inventory |
| ppm | parts per million |
| QAPP | Quality Assurance Project Plan |
| ROP | Rate-of-Progress Plan |
| SIP | State Implementation Plan |
| tpd | tons per day |
| VOC | Volatile Organic Compound |

**Cover photo:** Photographs of Houston from a 68th floor monitoring location under clear and smoggy conditions. *Source: EPA Air Quality Trends Site.*

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

September 29, 2004

**MEMORANDUM**

SUBJECT: EPA and States Not Making Sufficient Progress in Reducing Ozone Precursor Emissions In Some Major Metropolitan Areas
Report No. 2004-P-00033

FROM: J. Rick Beusse /s/
Director, Air Issues
Office of Program Evaluation

TO: Jeffrey R. Holmstead
Assistant Administrator for Air and Radiation (6101A)

Attached is our final report regarding Environmental Protection Agency and State efforts to progressively reduce ozone precursor emissions and measure actual precursor emission reductions as required by the Clean Air Act. This report contains findings that should help EPA in its efforts to ensure that the most polluted metropolitan areas expeditiously attain the 1-hour ozone standard, as well as help the Agency implement and oversee the more stringent 8-hour standard. Also, the report contains corrective actions the Office of Inspector General (OIG) recommends. This report represents the opinion of the OIG and the findings contained in this report do not necessarily represent the final EPA position. Final determination on matters in this report will be made by EPA managers in accordance with established procedures.

**Action Required**

In accordance with EPA Manual 2750, as action official, you are required to provide a written response within 90 days of the final report date. The response should address all recommendations. For the corrective actions planned but not completed by the response date, please describe the actions that are ongoing and provide a timetable for completion. If you do not concur with a recommendation, please provide alternative actions addressing the findings reported. We appreciate the efforts of EPA officials and staff, as well as external stakeholders, in working with us to develop this report. For your convenience, this report will be available at http://www.epa.gov/oig.

If you or your staff have any questions regarding this report, please contact me at (919) 541-5747 or John Price, Assignment Manager, at (404) 562-9837.

# *Executive Summary*

## Purpose

Ground level ozone, the most pervasive urban air pollutant, has been linked to respiratory illnesses and other serious public health concerns, such as asthma and heart disease. Over 159 million Americans live in areas that do not meet the Environmental Protection Agency's (EPA) current 8-hour ozone standard. Ozone also damages sensitive ecosystems and is responsible for more than one billion dollars in agricultural crop losses in the United States each year. Many of the most polluted metropolitan areas are still struggling to attain EPA's 1-hour ozone standard established over 25 years ago. The more stringent 8-hour standard that EPA and States began implementing in 2004 presents even greater challenges. The 1990 Clean Air Act Amendments recognized that reducing the precursor emissions that cause ozone – nitrogen oxides (NOx) and volatile organic compounds (VOC) – was the primary method for assuring permanent ozone reductions and, as such, mandated increasing levels of emissions reductions until attainment was achieved. Accordingly, our objectives were to answer the following:

- Have emission reduction controls been as effective as originally projected in reducing ozone precursor emissions (NOx and VOC)?

- Have emission reduction plans and related controls been properly completed and implemented to reduce precursor emissions by 3 percent annually within the timeframes established by the Act?

- Have EPA and States adequately measured the effectiveness of emission controls in reducing (1) overall precursor emissions as required by the Act, and (2) ambient ozone concentrations?

## Results in Brief

Despite national and regional progress, some major metropolitan areas have not achieved the ozone precursor emission reductions required by the 1990 Act. Our analysis of EPA emissions data for "serious," "severe," and "extreme" ozone nonattainment areas indicates that some major metropolitan areas may not have achieved the required 3-percent annual emission reductions in ozone precursor emissions. For example, 23 of 28 emissions reduction plans submitted since 1990 by 10 serious to extreme nonattainment areas raised questions as to whether required precursor emissions reductions were achieved by the dates specified in the Act. Further, precursor emissions in some areas may actually have increased. While EPA air trends reports have emphasized that ozone levels are declining nationally and regionally, only 5 of 25 nonattainment areas designated serious to extreme have experienced substantial downward trends in ozone levels. For some areas, EPA data indicate emission controls for the last 10 years have generally offset growth but have

not significantly reduced ozone levels. Also, analyses by EPA and other researchers indicate that recent downward trends in ozone may be more related to changes in weather patterns than emission reductions. Delays in reducing ozone levels can have serious health implications for persons in nonattainment areas.

EPA and States encountered numerous difficulties in developing and implementing adequate emission control plans for reducing ozone precursor emissions by 3 percent annually by the dates mandated in the Act. In addition, States may have used inaccurate data, assumptions, and projections of emission growth, resulting in fewer reductions planned than appropriate. For example, the ozone emissions reduction plan for the Atlanta metropolitan area assumed a growth rate that was about half of the population growth rate that the Atlanta metropolitan area experienced from 1980 to 2000, and about one-third of Atlanta's growth rate for employment. The Act requires emission reductions of at least 3 percent annually over and above an area's growth. Limited EPA oversight of the development and implementation of emission control plans contributed to the difficulties States encountered in reducing emissions by the required 3 percent annually. Additionally, a 1997 EPA policy allowing nonattainment areas to claim emission reductions from selected sources outside of the nonattainment areas allows for potential double-counting and does not ensure that reductions do more than just offset growth.

EPA and States have not adequately measured whether the Nation's worst ozone nonattainment areas have made acceptable progress in reducing ozone precursor emissions. In the 14 years since passage of the 1990 Amendments, EPA has not issued rules requiring States to demonstrate progress in reducing precursor emissions, nor guidance on how such demonstrations should be conducted, despite the Act's requirement to do so. Consequently, there is no approved, consistent, or reliable method to measure the success of ozone precursor emission reduction efforts. EPA still needs to develop specific, quantifiable goals and measures for ozone precursor emission reductions in nonattainment areas, and improve quality assurance processes and plans for emissions data reporting.

## Recommendations

This report contains information that should help EPA in its efforts to ensure that the most polluted metropolitan areas expeditiously attain the 1-hour ozone standard, as well as help the Agency implement and oversee the more stringent 8-hour standard.

We are making multiple recommendations to the Assistant Administrator for Air and Radiation to promulgate new ozone rules, issue guidance, and take other actions necessary to: (a) provide consistent and reliable methods to demonstrate that precursor emissions have been reduced; (b) ensure that States perform such demonstrations and implement needed controls where necessary; (c) expand the use of meteorologically adjusted ozone trends; (d) strengthen EPA oversight of planning; (e) ensure that control measures are timely developed, approved, and implemented;

and (f) develop data quality objectives and proper quality assurance plans and processes.

## Agency Comments and OIG Evaluation

In his September 17, 2004, response to the draft report, the Assistant Administrator noted that the report provides insightful recommendations for EPA's consideration. He also noted that some of the recommendations, such as those concerning the draft rule for milestone compliance demonstrations, seemed reasonable and would be explored as to how they can be implemented. However, he said other recommendations were "good in theory" but practical considerations constrain EPA from implementing them.

The Agency's response generally agreed with the report's findings except for the use of National Emissions Inventory (NEI) data as an indicator as to whether selected nonattainment areas had achieved ozone precursor emission reductions required by the Act. EPA's response indicated that NEI emissions data was not of sufficient quality and did not contain emission data in the proper units of measure needed to adequately determine the amount of emission reductions achieved by individual nonattainment areas. However, EPA has promoted the NEI as the highest quality emissions data available, has used the data for regulatory planning and support, and continues to use the data for national, regional, and State emission trends in publically released reports. Further, during our evaluation, senior EPA experts told the OIG that updated NEI emissions data could provide a reliable indicator of emissions reductions achieved by individual nonattainment areas. Additionally, the Agency provides NEI-developed emissions data to States for use in their periodic emissions inventories. As such, we continue to believe that NEI data is the best available indicator of whether individual nonattainment areas have met the precursor emission reductions required by the Act, and that analysis of the precursor emissions data in NEI will help EPA ensure that permanent ozone reductions have been achieved as required by the Act. The use of NEI data is further discussed in the OIG's evaluation of the Agency's response at the end of Chapter 2.

The Agency's response also indicated that EPA preferred to focus its limited resources on current and future implementation of the 8-hour standard rather than assess the effectiveness of its planning, controls, and emission reductions under the 1-hour standard since enactment of the 1990 Clean Air Act Amendments, over 14 years ago. We do not disagree that the Agency should utilize available resources on effective implementation of 8-hour policies, plans, and related emission controls. However, we believe that the Agency first needs to assess the effectiveness of its ozone policies, plans, and controls under the 1-hour standard before it can determine the most efficient and effective methods and controls for implementing the 8-hour standard. The Agency also provided technical comments on the draft report, and we have made changes in the final report as deemed appropriate.

The Agency's responses to individual recommendations and our evaluation are summarized at the end of each chapter. The Agency's response is included in its entirety as Appendix H, and that appendix includes a detailed OIG evaluation of the Agency response.

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# Chapter 1
## Introduction

## Purpose

The most complex, difficult to control, and pervasive urban air pollutant is tropospheric, or ground level, ozone. Tropospheric ozone has been linked to respiratory illnesses and other serious health concerns, such as asthma and heart disease. About 109 million Americans live in areas that do not meet EPA's 1-hour ozone standard – issued over 25 years ago – that requires ozone levels not exceed an average of .12 parts per million (ppm) over a 1-hour period.

Concerned with the lack of progress in controlling ozone, Congress enacted the Clean Air Act Amendments of 1990 (Act), in part, to ensure attainment of EPA's 1-hour ozone standard by specific dates. The 1990 Act recognized that reducing the precursor emissions that cause ozone – nitrogen oxides (NOx) and volatile organic compounds (VOC) – was key to ensuring permanent ozone reductions and, as such, mandated increasing levels of emissions reductions until attainment was achieved. Since then, research has found that ozone causes adverse health effects at lower levels and over longer periods of time than once thought. As a result, EPA issued a more stringent ozone standard that took effect in April 2004 requiring ozone levels not to exceed an average of .08 ppm over an 8-hour period. Because of difficulties in bringing areas into compliance with the 1-hour standard and the even greater challenges associated with the new 8-hour standard, our objectives were to answer the following:

- Have emission reduction controls in place been as effective as originally projected in reducing ozone precursor emissions (NOx and VOC)?

- Have emission reduction plans and related controls been properly completed and implemented to reduce precursor emissions by 3 percent annually within the timeframes established by the Act?

- Have EPA and States adequately measured the effectiveness of emission controls in reducing (1) overall precursor emissions as required by the Act, and (2) ambient ozone concentrations?

## Background

Ozone ($O_3$), a gas composed of three oxygen atoms, occurs naturally in the stratosphere approximately 10 to 30 miles above the earth's surface and forms a layer that protects life on earth from the sun's harmful rays. This is stratospheric ozone. Ozone is also formed at ground level by a complex, atmospheric chemical

reaction of oxides of nitrogen and volatile organic compounds in the presence of sunlight and heat. In addition to serious adverse health effects, this ground-level, or tropospheric, ozone also damages sensitive ecosystems and is responsible for more than one billion dollars in agricultural crop losses in the United States each year.

**VOC + NOx + Sunlight/Heat = Ozone**

Known as precursor emissions, sources of NOx and VOCs include a wide range of stationary, area, and mobile sources, including:

**Table 1.1: Sources of Precursor Emissions**

| Source | Examples of Sources |
|---|---|
| **Stationary** | Utilities, refineries, chemical manufacturers, automobile manufacturers, most other industrial activities |
| **Area** | Dry cleaners, service stations, wood burning stoves |
| **Mobile** | *On-road:* Cars, trucks, locomotives<br>*Off-road:* Heavy construction machinery, generators, off-road vehicles |

### *Clean Air Act Mandate for Precursor Emission Reductions*

In accordance with the Act, EPA and States are required to obtain increasing levels of VOC and NOx emission reductions until attainment is achieved. For example, nonattainment areas were to have reduced ozone precursor emissions 15 percent by 1996 and 24 percent by 1999 from a 1990 baseline.

The 1990 Act requires that ozone nonattainment areas reach attainment by specific dates based on their nonattainment classification. These requirements came about, in part, because States did not always fulfill State Implementation Plan (SIP) requirements during the 1980s to implement controls and reduce ozone precursor emissions. The 1990 Act established five nonattainment classifications (marginal, moderate, serious, severe, extreme), with varying compliance dates depending on the severity of an area's nonattainment in 1990, or at time of nonattainment designation. In accordance with Sections 110 and 185 of the Act, sanctions may be imposed against areas that fail to submit and implement adequate plans. Attainment status is determined from ambient air monitor readings from over 1,100 air monitors located throughout the United States.

### *Ozone Attainment Status*

As of May 2004, 47 areas initially classified "marginal" or "moderate" for ozone nonattainment had subsequently achieved the 1-hour ozone standard and been redesignated to attainment. However, 50 areas initially classified "marginal" to "extreme" under the 1990 Act still have not attained the 1-hour standard.

**Table 1:2: Designation Status of 50 Areas in Nonattainment, May 2004**

| Nonattainment Designation | Population Affected by Nonattainment | Clean Air Act Mandated Attainment Date | Areas Still Nonattainment as of April 2004 |
|---|---|---|---|
| **Extreme** | 17,784,000 | 2010 | 2 |
| **Severe** | 55,853,000 | 2005-2007 | 12 |
| **Serious** | 19,265,000 | 1999 | 10 |
| **Moderate** | 3,251,000 | 1996 | 6 |
| **Marginal** | 6,944,000 | 1993 | 19 |
| **Other**[a] | 6,542,000 | 2005 | 1 |
| **Totals** | 109,639,000 | | 50 |

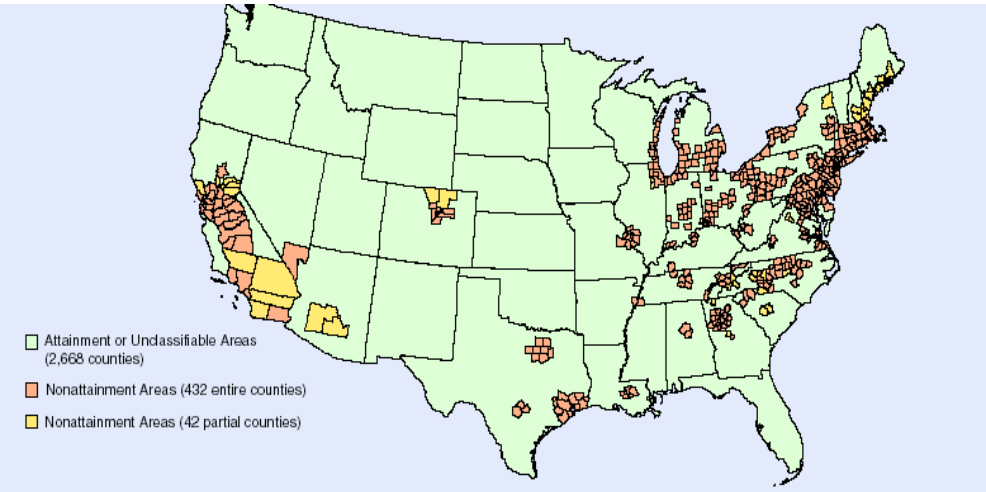
[a] San Francisco, California, was designated nonattainment and classified as a moderate nonattainment area in 1999 with a 2005 attainment deadline.

Twenty-one of the 25 areas classified "serious," "severe," or "extreme" were metropolitan areas. Only 4 of 25 areas classified serious or above have been redesignated to attainment since the 1990 Act was passed; 5 areas classified serious or above have been reclassified to a lower nonattainment classification.

As shown in Table 1.2, the attainment date specified in the Act has already passed for 35 of the 50 areas. Additionally, three areas (Atlanta, Georgia; Baton Rouge, Louisiana; and Washington, DC) were recently elevated from serious to severe nonattainment because of their failure to attain the 1-hour standard by 1999. The San Joaquin Valley, California, nonattainment area was elevated from severe to extreme nonattainment in 2004.

In April 2004, EPA designated 126 areas containing 474 counties as nonattainment for the more stringent 8-hour health-based ozone standard. The 219 counties that still have not achieved the 1-hour standard, as of May 17, 2004, are included in these 474 counties. The map below shows the location of the 474 counties; most lie within the largest metropolitan areas.

**Illustration 1.1: Map of Ozone Nonattainment Areas for the New 8-hour Standard**




**Source:** *The Ozone Report: Measuring Progress Through 2003,* EPA report published April 2004

Responsibility for national ozone policies, guidance, and program management is principally vested in the Office of Air Quality Planning and Standards (OAQPS), Research Triangle Park, North Carolina, which is within EPA's Office of Air and Radiation. Oversight of State and local ozone reduction programs is the responsibility of EPA's 10 regional offices.

### *Health Concerns Associated With Prolonged Ozone Exposure*

Health researchers have frequently associated ozone pollution with a variety of human respiratory problems, including asthma attacks, respiratory-related hospitalizations, reductions in lung function, respiratory symptoms (such as coughing, shortness of breath, and nausea), increased susceptibility to respiratory infection, and pulmonary inflammation. The health care costs of human exposure to outdoor air pollutants range from $40 to $50 billion annually. In addition, an estimated 50,000 to 120,000 premature deaths are associated with exposure to air pollutants. People with asthma experience more than 100 million days of restricted activity with an economic cost exceeding $4 billion.

Health effects can result from exposure to high levels of ozone over short time periods, but also from longer exposure to lower levels of ozone. One of the most common health problems attributed to unhealthy ozone levels is asthma. The prevalence of asthma in the United States has been increasing steadily. In 1980, an estimated 7 million people in the United States were diagnosed as having asthma, while in 2000 there were an estimated 29.5 million cases.[1] Recent studies have linked elevated ozone levels to school absences due to asthma and other

[1]It should be noted that a 1997 change in the survey form used may have had some impact on the different numbers.

respiratory ailments, and scientists have found that ozone may not only trigger asthma but also could contribute to the development of the disease in children. According to several public health organizations, including the American Public Health Association and Harvard Medical School, cases of asthma are rising so fast it is now widely viewed as an epidemic – one that is hitting hardest at the very young, minorities, elderly, and the poor.

## Scope and Methodology

To assess the effectiveness of ozone emission control efforts by EPA and States, we reviewed documentation, regulations, and guidance, and EPA and external analyses/studies of air monitoring data for individual ozone nonattainment areas. We also performed analyses of data from EPA's National Emissions Inventory (NEI) and Air Quality System, and interviewed officials from OAQPS, six EPA regions, and two States. Additional interviews were conducted with external atmospheric modeling scientists/engineers and other external stakeholder organizations. Budget and staffing information related to EPA's ozone program were obtained from OAQPS and the EPA's Office of the Chief Financial Officer. We also reviewed pertinent sections of the Clean Air Act, as amended.

Our field work was generally conducted from February 2003 to May 2004. We conducted this evaluation in accordance with *Government Auditing Standards*, issued by the Comptroller General of the United States. Additional details on our scope and methodology are in Appendix A.

# Chapter 2

## Despite National and Regional Progress, Some Major Metropolitan Areas Have Not Achieved Required Emission Reductions

Our analysis of EPA emissions data for serious, severe, and extreme ozone nonattainment areas indicated that some areas may not have achieved the emission reductions mandated by the CAA, and precursor emissions of NOx and VOCs in some areas may actually be increasing. While EPA air trend reports have emphasized that ozone levels are declining nationally and regionally, only 5 of 25 serious to extreme nonattainment areas have experienced significant downward trends in ozone levels. Also, recent downward trends may be more related to changes in weather patterns than emission reductions. For individual serious to extreme nonattainment areas, EPA data indicate emission controls for the last 10 years have generally offset ozone growth but have not significantly reduced ozone levels. Factors that contributed to these conditions included delays in developing Rate-of-Progress Plans and controls (see Chapters 3-4), insufficient measurement of emission reductions (see Chapters 5-7), and inadequate EPA guidance and oversight.

### Act Required Specific Emission Reductions

Section 182 of the Act required that ozone nonattainment areas develop and implement specific emission reduction plans within certain time frames to reduce precursor emissions until attainment was achieved. The Act also required that precursor emissions be reduced an average of 3 percent annually "net of growth" (the minimum percentage reduction plus any projected growth in emissions) for each 3-year period subsequent to the enactment of the 1990 Clean Air Act Amendments (CAAA). Further, the Act required that plans include contingency control measures in case the primary controls did not achieve the required reductions in precursor emissions or the area failed to attain the ozone standard by the statutory attainment date. The following emission reduction plans were required:

- The first emission reduction plan, referred to by EPA as the 15-percent Rate-of-Progress (ROP) Plan, was to be submitted by State and local agencies within 3 years of enactment of the 1990 Act (November 15, 1993), and achieve a minimum 15-percent reduction in VOCs within 6 years (November 15, 1996).

- Additional ROP Plans to reduce precursor emissions at a rate of at least 3 percent annually "net of growth" were required for each 3-year period after 1996 until an area attains the 1-hour standard. These additional plans, referred to by EPA as "post-1996 ROP Plans," or 9-percent ROP Plans, were required to be submitted by States within 4 years of enactment (November 15, 1994). The first post-1996 ROP Plan had a November 15, 1999, milestone date.

In addition to ROP Plans, Section182(g)(2) of the Act required States to demonstrate that these emission reductions had actually been achieved. States with serious and above nonattainment areas were to submit milestone compliance demonstrations within 90 days after the milestone date for achieving emission reductions. The Act also required States to submit 1990 baseline VOC and NOx emission inventories for each nonattainment area and, thereafter, develop periodic emission inventories for every 3-year period, until attainment of the ozone standard. According to OAQPS, their interpretation of the Act is that the demonstrations should include a comparison of baseline inventories to the applicable periodic emission inventories as a measure of emission reductions.

A timeline of the Act's requirements is provided in Appendix B.

## Required Emission Reductions Not Achieved

The NEI, maintained by OAQPS, is a continuously updated national database of air emissions information based on input from numerous State and local air agencies, tribes, and industry. This database contains information on stationary and mobile sources that emit criteria air pollutants and their precursors, such as VOCs and NOx, as well as hazardous air pollutants. The inventory is continuously updated, focusing on every third, periodic inventory year (1990, 1993, 1996, 1999, etc.). Starting in 2003, OAQPS initiated a major effort to update the inventory's VOC and NOx data back to 1990 based on the EPA's latest models, methodologies, and emission factors. As of January 2004, inventory data had been updated from 1990 through 1999. According to Agency officials, the NEI is EPA's best available data on facility emissions at the present time.

Our analysis of 1990-1999 VOC and NOx data in EPA's NEI database for 12 serious or severe nonattainment areas indicated that some areas may not have achieved the emissions reductions required. For example:

- Seven areas did not achieve a 15-percent reduction in VOCs by the November 15, 1996 deadline, and six of the seven areas still had not achieved a 15-percent reduction by the next deadline – November 15, 1999.

- Eight areas did not achieve the combined 24-percent reduction in precursor emissions by the November 15, 1999, deadline; however, two of the eight

areas (Sacramento, California, and Washington, DC) were within 1 percent of the required 24-percent reduction.

Table 2.1 shows the emission reductions achieved by the 12 nonattainment areas between 1990-1996 and 1990-1999. Nonattainment area reductions that did not meet the Act's required 15-percent VOC reductions by 1996 are shown in bold blue text; similarly, combined VOC and/or NOx reductions that did not meet the 24-percent reduction requirement by 1999 are shown in bold red text. A negative number indicates an increase in emissions. Also, 1990 NEI emissions for each nonattainment area were adjusted for noncreditable emissions as required by the Act.[2]

**Table 2.1: Percent Reduction In Precursor Emissions**

| Nonattainment Area | % Reductions by 11/15/1996 | % Reductions by 11/15/1999 | | |
|---|---|---|---|---|
| | VOC | VOC | NOx | Combined |
| Atlanta (GA) | **-10.92** [a] | -14.04 | -17.68 | **-31.72** [b] |
| Baltimore (MD) | 28.73 | 23.90 | 6.97 | 30.87 |
| Boston-Lawrence-Worcester (MA, NH) [c] | **5.39** | 10.11 | 17.68 | 27.79 |
| Chicago-Gary-Lake County (IL, IN) [c] | **-13.33** | 0.81 | -1,72 | **-0.91** |
| Dallas-Fort Worth (TX) | **11.73** | 17.25 [d] | -12.11 | **17.25** |
| Milwaukee-Racine (WI) [c] | **-26.44** | 12.68 [d] | -17.80 | **12.68** |
| Portsmouth-Dover-Rochester (NH) | **-2.10** | -18.67 | 17.61 | **-1.06** |
| Providence (RI) | 19.38 | 8.19 | 6.50 | **14.69** |
| Sacramento Metro (CA) | 20.28 | 15.88 | 7.75 | **23.63** |
| San Joaquin Valley (CA) | 42.78 | 35.53 | -0.85 | 34.68 |
| Springfield (MA) | 18.48 | 16.51 | 15.23 | 31.74 |
| Washington DC Area (DC, MD, VA) | **3.82** | 9.25 | 14.38 | **23.63** |

a Blue text indicates nonattainment area reductions that did not meet the required 15-percent reduction in VOCs by 1996. The negative sign in front of the numbers means that there was an increase in precursor emissions.

b Red text indicates nonattainment area combined reductions that did not meet the required 24-percent reduction in VOC and/or NOx emissions by 1999.

c States claimed either NOx or VOC emission reductions outside of nonattainment areas in post-1996 ROPs for Illinois portion of Chicago-Gary-Lake County, New Hampshire portion of Boston-Lawrence-Worcester, and Milwaukee-Racine. The emission sources outside of these areas, for which emission credit was claimed, were added to analysis of overall reductions.

d Dallas-Fort Worth and Milwaukee-Racine 15-percent and post-1996 ROPs included only VOC controls; therefore, only VOC reductions were included in combined reduction total for each.

EPA's NEI data indicate that precursor emissions actually increased between 1996 and 1999 for eight areas. For many of these areas, the increase could indicate that, although the minimum 9-percent in required emission reductions may have been

[2]The Clean Air Act prohibits nonttainment areas from receiving credit for emission reductions from certain pre-1990 emission controls, primarily Federal emission control programs. Nonattainment area baseline emissions must be adjusted for projected reductions from these controls between 1990 and the applicable ROP milestone date.

achieved, the reductions attained between 1996 and 1999 were not "net of growth." Similarly, one area (Providence) that achieved a 15-percent VOC reduction by November 15, 1996, had significantly less than 15-percent by November 15, 1999, potentially due to growth in VOC emissions. According to the 1990 Act, required reductions should be the minimum specified percentage plus any projected growth in emissions.

Table 2.2 shows those areas where VOC and/or NOx emissions increased between 1996 and 1999.

**Table 2.2: Nonattainment Areas With Increasing NOx and/or VOC Emissions**

| Nonattainment Area | Precursor | % Change in Emissions 1990-1996 | % Change In Emissions 1990-1999 | % Change In Emissions 1996-1999 [a] |
|---|---|---|---|---|
| Atlanta | VOC | 12.6 | 14.04 | **1.44** |
| Baltimore | VOC | -28.73 | -23.9 | **4.83** |
| Dallas-Fort Worth | NOx | 0.76 | 12.11 | **11.35** [b] |
| Portsmouth-Dover-Rochester | VOC | 2.1 | 18.97 | **16.87** |
| Providence | NOx | -18.55 | -6.5 | **12.05** |
| | VOC | -19.38 | -8.19 | **11.19** |
| Sacramento Metro | NOx | -20.28 | -7.75 | **12.53** [b] |
| San Joaquin Valley | NOx | -13.87 | 0.85 | **14.72** [b] |
| | VOC | -42.78 | -35.53 | **7.25** |
| Springfield | NOx | -22.96 | -15.23 | **7.73** |
| | VOC | -18.48 | -16.51 | **1.97** |

a Red text indicates those areas that experienced an increase in VOC or NOx emissions between 1996 and 1999. The negative sign in front of the numbers means that there was a reduction in emissions.
b These areas did not include NOx controls in their post-1996 ROPs.

## EPA Analyses and Reports Indicate No Significant Improvements in Ozone Levels for Many Nonattainment Areas

Despite the decreases in ambient ozone concentrations nationwide and regionally, recent EPA analyses and long-term trend reports show that there have been no significant improvements in ozone levels for individual nonattainment areas, especially metropolitan areas. As discussed below, decreases in ambient ozone observations may be more related to temporary factors such as changes in weather and wind patterns than in reduction of precursor emissions.

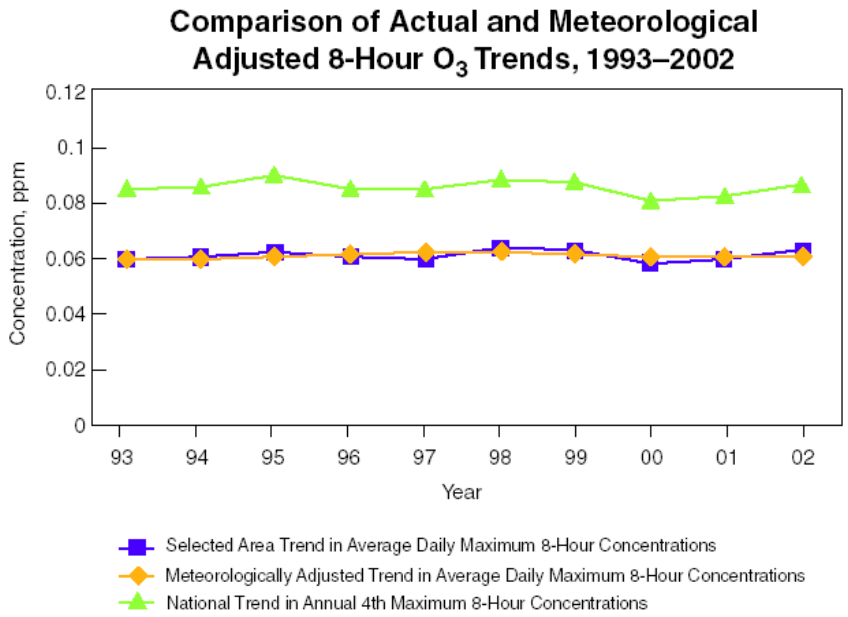
### *EPA Analyses of Meteorologically Adjusted Ozone Observations*

In 2003, OAQPS developed and analyzed 1990 through 2002 meteorologically adjusted ambient 8-hour ozone observations for 53 metropolitan areas, which included 19 serious, severe, and extreme ozone nonattainment areas. Our analysis of the ozone levels and charts developed by OAQPS for the 19 nonattainment

areas indicated that, once weather had been excluded as a factor in ozone formation, 12 areas had achieved little or no improvements in ozone levels over the 13-year period. Ten of the 12 areas had approximately 5 percent or less decrease in ozone levels, while two actually had increases in ozone levels of up to 9 percent since 1990. Three of the 12 areas had also exhibited upward trends in ozone levels between 1999 and 2002. The remaining seven areas had downward trends in ozone, ranging from reductions of about 7 percent to almost 15 percent (Los Angeles area). Further details are in Appendix C.

EPA included an analysis of the 1993 through 2002 meteorologically adjusted ozone data for the 53 metropolitan areas in the publically released report, *Latest Findings on National Air Quality, 2002 Status and Trends*, dated August 2003. EPA's conclusions generally confirmed the results of our analysis of the same data, stating ". . . the meteorologically adjusted trend for this 10-year period can be seen as relatively flat." This trend indicates that emission controls have effectively eliminated growth in ozone pollution but have not significantly reduced ozone levels since 1993, as shown in Illustration 2.1.

**Illustration 2.1:**




### *Ozone Trends from EPA's Air Quality System*

At our request, OAQPS performed a special trend analysis of 1-hour and 8-hour ozone exceedance days and maximum observed ozone levels for the period 1992 through 2003 using EPA's Air Quality System. The study included 25 serious to extreme nonattainment areas covering 21 metropolitan and 4 non-metropolitan areas. For the 25 serious to extreme nonattainment areas:

- Four experienced statistically significant downward trends in the number of ozone exceedance days for the 1-hour standard;

- Five experienced downward trends under the 8-hour standard; and

- The remaining areas showed no statistically significant upward or downward trends.

In terms of maximum ozone level observations between 1992 and 2003 for the 25 serious to extreme areas,

- Five experienced statistically significant downward trends under the 1-hour standard;

- Five experienced statistically significant downward trends under the 8-hour standard; and

- All but one of the remaining areas showed no statistically significant upward or downward trends (El Paso area showed statistically significant upward trend).

Details are in Table 2.3.

**Table 2.3: Summary for Trend Report With Nonattainment Area Totals**

| Standard | Ozone Exceedance Days 1992-2003 | | | | | Maximum Ozone Observations 1992-2003 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Down Trend[a] | | No Trend[a] | Up Trend[a] | | Down Trend[a] | | No Trend[a] | Up Trend[a] | |
| | Sig. | Not Sig. | | Sig. | Not Sig. | Sig. | Not Sig. | | Sig. | Not Sig. |
| 1-hour | 4 | 13 | 3 | 0 | 5 | 5 | 16 | 0 | 0 | 4 |
| 8-hour | 5 | 10 | 0 | 0 | 10 | 5 | 13 | 0 | 1 | 6 |

a EPA determined the up and down trends through a linear regression analysis of the actual ozone exceedance days and observed maximum ozone levels for each nonattainment area.

### *Analysis of Two Major Metropolitan Areas Shows Little Change in Precursor Emissions*

The Photochemical Assessment Monitoring Station (PAMS), established within most metropolitan nonattainment areas in 1994, measures ambient concentrations of NOx and many VOCs. In 2002 EPA performed a limited analysis of PAMS data for two severe nonattainment areas – Atlanta and Chicago-Gary-Lake County. According to the EPA study,[3] composite NOx trends for the 1995-2001 period were generally flat for the Chicago area, and showed a slight upward trend for the Atlanta area. None were statistically significant, indicating little change in

[3]The report, *Analysis of Ambient Air Quality Trends in the Chicago and Atlanta Ozone Nonattainment Areas,* was issued on September 30, 2002.

NOx emissions. However, 1995-2001 VOC concentrations did decline during the morning precursor buildup period, although this decline was not consistent and needed further study.

The EPA report further stated that decreases in ambient peak ozone concentrations in the Chicago area from 1991-2001 (1-hour) and 1996-2001 (8-hour) were fairly modest, and none of the composite trends were found to be statistically significant. For the Atlanta area, annual 1-hour ozone design values[4] showed a slight upward trend for the 1991-2001 period, while annual 8-hour design values decreased between 1996-2001, primarily because of a relatively large drop in 2001 ozone levels.

### *Despite National and Regional Progress, Many Metropolitan Areas Show Little Change*

EPA air quality trend reports for 2001 through 2003 generally documented downward trends in ozone levels and in precursor emissions, especially VOCs, at the national and regional level over the last 10- and 20-year periods. Recently, however, EPA reports[5] have noted that NOx emissions have only been reduced 12 percent in the last 10 years and only 15 percent over the last 20 years, and that more NOx reductions will be necessary before more substantial ozone air quality improvements are realized. For example, in its September 2003 report on ozone trends, EPA noted there were increases in certain key areas:

> *Ozone concentrations are on the increase in several cities in the southeastern and midwestern United States, while urban areas on the West Coast and in New England generally show decreasing trends. The 1-hour trends show an increasing number of cities with upward ozone trends in the western and mid-Atlantic urban areas and a decreasing number of cities with upward ozone trends in the Southeast.*

Similarly, in April 2004, EPA reported[6] that the 2003 ozone season had exhibited the lowest observed ozone levels since 1980, yet some areas – especially metropolitan areas – had not experienced a significant downward trend in ozone levels. EPA also noted that favorable weather conditions assisted in the lower ozone concentrations, and EPA cites a study of meteorologically adjusted ozone trends for individual regions and 35 metropolitan areas, which found that:

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[4]Ozone design values generally represent the 4th highest daily maximum value (reading) over a 3-year period; however, if only 2 years of data are available, the design value is the 3rd highest daily maximum value; if only 1 year, the 2nd highest daily maximum value is the design value.

[5]*Latest Findings on National Air Quality,* August 2003, and *National Air Quality and Emission Trends Report, 2003,* September 2003.

[6]*The Ozone Report: Measuring Progress Through 2003,* April 2004

*...The influence of weather makes it difficult to isolate the specific changes in ozone concentrations that result from VOC and NOx reductions. In addition... assessing trends in ozone levels nationally or by EPA Region may mask important local differences that make it difficult to determine direct influence of emission reductions....*

*Before adjusting for weather, EPA Regions 3, 4, and 6 show improving air quality, with average reductions in ozone levels of 9% to 21%. After adjusting for weather, however, each Region demonstrates a more moderate decline. The most dramatic effect of the meteorological adjustment is in Region 4, where the adjusted trend shows a 4% decrease, compared with a 21% decrease for the unadjusted trend. Region 6 shows the largest improvement, 9%, after adjusting for meteorology. Ozone levels in the midwest and central regions of the country show the same percent increase in ozone both with and without the meteorological adjustment. EPA Region 2 shows a larger increase in ozone levels after the meteorological adjustment is applied.*

## Reports By Others Also Find Little Change in Some Areas

EPA analyses indicating little improvements in ozone levels for many nonattainment levels are supported by an independent analysis for the Atlanta nonattainment area and reports issued by the American Lung Association.

### *Atlanta Report Notes 2001 Ozone Levels Same as 1981*

A 2002 independent study of Atlanta's meteorologically adjusted 8-hour ozone levels for the period 1981 through 2001 was performed by an atmospheric research scientist with the Georgia Institute of Technology. He used the EPA method of statistically adjusting out weather variations for the 20-year period. The study concluded that, between 1981 and 2001, there had been no statistically significant changes in ozone levels for the Atlanta area due to reductions of precursor emissions, once weather was eliminated as a factor. In essence, reductions in precursor emissions had only offset emissions growth during the period.

### *American Lung Association Reports Indicate Ozone Decreases May Be Weather Related*

*State of the Air* reports published by the American Lung Association for 2003 and 2004 indicated that ambient ozone levels have decreased, but the reports also suggest that reductions may be primarily attributable to cooler summers and more rain than usual in some areas. For example, one American Lung Association news release stated that analysis of ozone data since the mid-1990s showed no significant ozone improvements except where there were changes in weather

patterns. Additionally, another American Lung Association report was quoted as stating that the air quality improvements for the Atlanta nonattainment area were largely attributed to rain and cooler temperatures during the past three summers.

## Conclusions

Our analysis of EPA emissions data indicate that some serious to extreme major metropolitan nonattainment areas have not reduced emissions as required by the Act. Also, EPA air quality data and trend reports show that although ozone levels have improved nationally, some areas have not experienced these improvements, especially metropolitan areas. At least 21 of the 25 serious to extreme ozone nonattainment areas represent some of the largest metropolitan areas in the country, and a majority of the nonattainment areas are still struggling to achieve the 1-hour standard.

Given the health consequences of ozone and the repeated delays in achieving meaningful reductions over and above emissions growth, EPA needs to fully utilize all available methods to measure the effectiveness of emission controls implemented by individual nonattainment areas, especially metropolitan areas, in reducing ozone and determining whether nonattainment areas have achieved reductions in emissions required by the Act. EPA should consider using the NEI or other available methods to analyze whether all serious and above 1-hour nonattainment areas met emission reduction requirements, and require implementation of contingency measures where reductions may not have been achieved. If areas have failed to properly implement required emission controls, enforcement actions or sanctions as authorized under Section 185 of the Act may be necessary.

Delays in developing ROP Plans and implementing emission controls (see Chapters 3-4), and insufficient evaluating and measuring of emission reductions (see Chapters 5-7) contributed to these conditions. Recommendations that address correcting these specific problems are also in those chapters. Delays in reducing emissions and related ozone levels have serious health implications for persons in nonattainment areas, particularly persons with chronic respiratory illnesses and vulnerable populations such as children and older adults. Therefore, it is necessary to address these problems as expeditiously as possible.

## Recommendations

We recommend that the Assistant Administrator for Air and Radiation:

2-1 Perform an in-depth evaluation of the compliance of all serious to extreme nonattainment areas with emission reduction requirements using, at a minimum, precursor emissions data contained in the Agency's NEI database.

2-2 Implement contingency measures and additional controls, where appropriate, as required under Section 182(g)(3) of the Act, if nonattainment areas have not met the Act's emission reduction requirements, including the use of any enforcement and/or sanctions available under Section 179 of the Act for failure of a State to submit adequate plans and/or failure to timely and adequately implement planned controls to achieve required emission reductions by the statutory milestone dates.

## Agency Comments and OIG Evaluation

The Agency did not agree with our use of NEI data to measure emission reductions by individual nonattainment areas. EPA's response stated that the use of NEI data to measure emission reductions would produce "dubious results" because: (1) the Act requires that States demonstrate reductions on a tons per summer day basis - using the NEI only allows an analysis of reductions using annual emissions data, a significant difference; (2) the NEI database simply does not have the same quality of data as emission inventories developed by States - the OIG's draft report provides that a major failing of the NEI is its lack of documentation of methods used by the States to prepare emission estimates; and (3) EPA efforts to update the NEI emissions data efforts did not produce emission estimates that match State SIP emission inventories for all years, and, again, represent annual, not daily emission values.

As stated in our report, the Act requires that States demonstrate that precursor emissions have been reduced an average of 3 percent annually "net of growth" for each 3-year period subsequent to the enactment of the 1990 Act. The Act does not require that States demonstrate attainment of emission reductions in "tons per summer day." Also, EPA adjusts the NEI every 3 years based on State emissions data that is expressed in tons per day or tons per summer day to a tons per year expression.

EPA has indicated that the NEI is the highest quality emissions data maintained by the Agency and has used this data for regulatory planning and support; national, regional, and State emission trends; and public information reports. However, the Agency now states that the NEI is not of sufficient quality to indicate whether nonattainment areas met emission reduction requirements in the Act, and asserts that State SIP inventories are best for such measurements. According to EPA documentation and our analysis, State inventory data is used every 3 years to update NEI; therefore, NEI and State emissions data should reflect the same level of quality. The Agency further asserts that state inventories cannot be used to measure nonattainment area accomplishments in reducing precursor emissions because baseline and subsequent periodic inventories were produced using different models and factors. EPA has stated that requiring updates to baseline and periodic inventories would be too burdensome on States.

These contentions by EPA would leave no actual, comparable emissions data available, State or national, to assess nonattainment progress as required by the Act. However, the OIG looked for emissions data that could provide a reliable indicator as to whether nonattainment areas had achieved precursor emission reductions required by the Act. Noting that the NEI was being updated for the 1990 to 1999 period based on the latest models and emissions factors, EPA senior officials – including some regional officials – said that this updated NEI data would provide a reliable indicator of whether nonattainment areas met emission reduction mandates. This is the data we used in our analysis.

In response to recommendations presented in Chapter 2, the Agency indicated that it preferred to focus its efforts and resources on developing plans and strategies that will implement the more health-protective 8-hour standard rather than evaluate progress toward the 1-hour standard. We agree that the Agency should focus resources on implementation of the 8-hour standard. However, the Agency and States need to measure and assess the actual effectiveness of controls implemented under the 1-hour standard before developing controls for the 8-hour standard. This assessment could be a valuable tool in identifying 1-hour controls that were not effective, overestimates of emission reductions from 1-hour controls, and methods for increasing the effectiveness of controls to be included in 8-hour Rate-of-Progress Plans. Many new nonattainment areas were designated under the 8-hour standard. These areas will be implementing many of the emission controls already implemented by 1-hour nonattainment areas. EPA needs to know how effective these 1-hour controls were in reducing emissions and identify where improvements may be needed before developing 8-hour emission control plans for these areas. An assessment of actual reductions achieved by 1-hour controls could identify the need for EPA to adjust the expected emission reductions from these controls and/or develop alternative controls to meet 8-hour milestones. A viable method for assessing control effectiveness is to measure emission reductions that actually occurred from implementation and compare reductions achieved to the projected or expected reductions included in 1-hour plans. Finally, EPA needs to identify 1-hour areas that did not achieve required emission reductions for the 1-hour standard and implement the available contingency measures. For areas that have struggled for years to meet the less stringent 1-hour standard, implementation of contingency measures should further reduce emissions in these areas and better facilitate the achievement of the more stringent 8-hour standard. Therefore, we continue to believe that the recommendations in Chapter 2 are valid and realistic actions that EPA needs to take to ensure more effective implementation of the 8-hour standard.

# Chapter 3
## Rate-of-Progress Plans Delayed or in Error

EPA and States encountered numerous difficulties with the timely development and implementation of Rate-of-Progress (ROP) Plans for nonattainment areas, and often did not approve and begin implementing those plans until deadlines in the 1990 Act for achieving the emission reductions had passed. Furthermore, States may have used inaccurate assumptions and projections of emission growth in ROPs, resulting in unmet emission reduction goals. There were numerous reasons for these conditions, including inadequate EPA oversight and insufficient policies and guidance related to ROP development and technical support.

Because the number of ozone nonattainment areas has greatly increased with implementation of the new 8-hour standard, States will be required to develop many more ROPs and related SIP revisions than were required under the 1-hour standard. To facilitate the timely development and implementation of State ROPs and emission controls for those areas struggling to meet the 1-hour standard, as well as those areas required to implement the new 8-hour standard, EPA must improve its ozone guidance and oversight.

## States Encountered Problems in Submitting Acceptable ROPs

As noted in Chapter 2, each ozone nonattainment area is required to develop emission reduction plans (in the form of ROP Plans) that articulate how precursor emissions will be reduced to achieve required ozone levels. The 1990 CAAA sets specific deadlines for submission of ROP Plans. For example, States were required to submit the initial ROP Plan for 15-percent VOC reductions by November 15, 1993, with implementation of controls and achievement of emission reductions by November 15, 1996. However, our evaluation of the first ROP Plans developed by States under the 1990 CAAA for 10 serious or severe nonattainment areas, involving a total of 14 ROP Plans, found that only 5 of 14 ROP Plans were submitted on time, and these often required revisions. Some were submitted nearly 2 years late.

Many States were also late in developing acceptable ROP Plans for the subsequent 9-percent reduction of VOCs and NOx that were to be submitted by November 15, 1994, with emission reductions achieved by November 15, 1999. EPA allowed States until mid-1997 to submit these plans, but only 3 of the 14 ROP Plans were submitted by the revised 1997 deadline.

According to EPA, many of the proposed plans were deficient and had to be revised several times before final approval. Also, States took extensive periods of time to make revisions (often more than a year and as much as 6 years), and EPA took a great deal of time to review and approve the revised and final ROP Plans. These conditions contributed to a substantial delay in EPA's proposed and final ROP Plan approvals, as well as delays in the implementation of related emission controls. Section 110(k)(3) of the Act requires that ROP Plans be approved or disapproved within 18 months of State submission unless EPA grants a conditional approval (which only provides at most a 1-year extension). However, none of the plans received final approval within 18 months of initial State submission. ROP Plans in many cases were not approved until years after the milestone dates for achieving required emission reductions. Appendix D provides details for each of the 10 nonattainment areas.

Officials in five EPA regions stated that major changes in Inspection and Maintenance (I&M) guidance and State delays in implementing I&M programs were two primary reasons for delays in developing acceptable ROP plans. In one region, several nonattainment areas had temporarily attained the ozone standard and the region suspended ROP Plan development until the areas again violated the standard. Regional officials also noted the following additional problems:

- Lack of definitive EPA guidance for the States on how to prepare and document ROP Plans.

- Lack of EPA guidance concerning emission reduction crediting for various local and regional control measures.

- The transitory nature of some EPA guidance, which created uncertainty among States as to how to revise and finalize ROP Plans.

- Delays in development of final, acceptable 15-percent ROP Plans led to delays in the subsequent 9-percent plans because one was dependent on the other.

- Timing of controls not yet implemented by the States, and the State's ability to support likelihood of expected emission reductions.

As will be discussed below, we also found that, in order to reasonably ensure permanent ozone attainment before suspending ROP development, improvements are needed in EPA's "Clean Data Policy."

### *Criteria in Clean Data Policy Needs Updating*

A May 1995 EPA policy, referred to as the "Clean Data Policy," provides that certain SIP requirements, including ROP Plan development, may be suspended once ambient air monitoring data indicate attainment of the 1-hour standard. Generally, this means an area has gone for 3 years with a total of three or less 1-

hour exceedances. Using this policy, four nonattainment areas suspended their development of post-1996 ROP Plans when ambient air monitoring data showed that they had achieved the 1-hour standard in either 1998, 1999, or 2000. However, all four subsequently violated the standard again. ROP development then had to be re-started and, as a result, emissions control plans for these areas were delayed. According to EPA officials, changes in meteorological conditions caused these areas to again violate the 1-hour standard, indicating that the standard had not been achieved by permanent and enforceable emission reductions within the nonattainment area or by upwind contributing sources.

Today methodologies and data exist that were not available in 1995 that allow regulators to better assess the permanence of attainment. In our view, the Clean Data Policy should be revised to require meteorologically adjusted ozone trend analyses along with a trend analyses of ambient VOC and NOx concentrations for nonattainment areas that subsequently reach attainment based on ambient ozone monitoring data. These changes would better ensure the permanence of such attainments. EPA should also consider whether upwind contributing sources have been sufficiently controlled to allow attainment to continue before suspending ROP requirements.

## Planned Emission Reductions Not Always Achieved by Required Milestone Date

Twenty-three of the 28 ROP Plans we reviewed for 10 serious and severe nonattainment areas indicated that the emission reductions projected in these plans were not achieved by the dates specified in the Act. While there were multiple reasons for delayed ROP implementation, delays in implementing vehicle I&M programs and promulgating Federal rules for VOC reductions were the primary reasons that statutory deadlines were missed.

### *Delayed I&M Programs*

ROP Plans for 9 of the 10 nonattainment areas projected significant emission reductions from implementation of vehicle I&M programs, but 7 of these experienced delays in implementing their I&M programs. Approved ROPs and related documentation for five of the nine areas indicated that the I&M programs were not fully implemented until 2000 or 2001, several years later than needed to meet the Act's deadlines. Also, we found that one I&M program (Georgia) had projected VOC emissions reductions based on an assumption of 100-percent effectiveness, whereas program records showed that their I&M program was only 81-percent effective. As a result of these conditions, estimated emission reductions in both the 15-percent and 9-percent ROP Plans were not achieved by November 15, 1999.

While some delay in State implementation of vehicle I&M programs can be attributed to statutory and EPA guidance changes in 1995 and 1996, this does not explain why I&M programs were still not fully implemented by 2000 and 2001. For example, the Texas I&M program represented 51 percent of the VOC emissions reductions in the Dallas-Fort Worth 15-percent ROP Plan. However, neither the 15-percent nor the subsequent 9-percent ROP Plans for the Dallas-Fort Worth area were proposed for final approval until January 18, 2001. An August 1997 Federal Register notice for a proposed conditional interim approval of Texas' 15-percent ROP noted that the State had discontinued implementation of its I&M program after initial submission of the 15-percent ROP plan, and that emission reductions related to the I&M program had not been achieved by November 15, 1996. EPA Region 6 granted Texas' request for conditional interim approval based on the premise that the reductions would be achieved "as soon as practicable." Subsequently, full conditional interim approval of the 15-percent ROP Plan was granted in November 1998, with the condition that final approval would not be granted until actions related to the I&M program were complete. However, the January 18, 2001, proposed approval of the 15-percent and 9-percent ROP Plans indicated that the Texas I&M program had still not received final EPA approval.

### *Delayed Promulgation of Federal VOC Rules*

Initial 15-percent ROP Plans for the 10 nonattainment areas included emission reductions for Federal VOC rules that were not promulgated until September 1998 and not effective until 1998 or 1999. These projected reductions ranged from 4 to 20 percent of total projected emission reductions in 15-percent ROP Plans. However, two States (Massachusetts and Wisconsin) subsequently issued State VOC rules to ensure that the emission reductions occurred before November 15, 1996. In addition, 15-percent ROPs for three areas included VOC reductions for a Federal rule on off-road/small engine standards that had compliance dates of May 1997 and January 1998, 6 to 14 months after the Act's milestone date of November 15, 1996.

EPA guidance[7] allowed States to claim VOC reductions for these delayed Federal rules even though the emission reductions would not be accomplished until after the milestone date for the 15-percent ROP Plan. EPA indicated that because States had counted on these Federal rules for their 15-percent plans, they should not be penalized because EPA was unable to promulgate the rules on time. As a result, significant amounts of VOC emission reductions were not achieved until almost 3 years after the Act's required milestone date of November 15, 1996. For example, the Washington, DC, nonattainment area claimed a total of 25.81 tons per

[7]"Credit for the 15 Percent Rate-of-Progress Plans for Reductions from the Architectural and Industrial Maintenance (AIM) Coating Rule and the Autobody Refinishing Rule," November 29, 1994; "Regulatory Schedule for Consumer and Commercial Products under Section 183(e) of the Clean Air Act," June 22, 1995; and "Guidance on Projection of Nonroad Inventories to Future Years," February 4, 1994.

day, or 20.81 percent of total emission reductions in its 1996 15-percent ROP Plan based on Federal VOC rules that were not issued until September 1998. These VOC rules included architectural and industrial maintenance coatings, auto refinishing, and commercial/consumer products.

### *Extended Dates for Achieving Emission Reductions*

ROP Plans for six nonattainment areas stated that projected VOC emission reductions had not been accomplished by the milestone date of November 15, 1996. For two areas, ROP Plans further indicated that the 15-percent in VOCs and 9-percent reductions in VOCs and NOx would not occur until 2001, almost 2 years after the post-1996 ROP Plan milestone of November 15, 1999. EPA approved the ROP Plans based on achievement of the reductions as expeditiously as practicable. These approvals were primarily based on general nonattainment area plan provisions in Section 172(c)(1) of the Act, which provides for implementation of all reasonably available control technology "as expeditiously as practicable."

## Emission Reductions Underestimated Due to Inaccurate Growth Projections and Other Factors

For 15 of 28 ROP Plans, the projected VOC and/or NOx target levels for the applicable milestone date were significantly less than the actual Periodic Emissions Inventory (PEI) for the same date. These differences potentially represent an under estimation of required emission reductions needed by 1996 and 1999, respectively. Differences between PEIs and VOC and/or NOx target levels exceeded 10-percent for 15 of 28 ROPs. The potential under projection of required emission reductions in these cases ranged from about 7 tons to over 175 tons per day.

To ensure that actual emission reductions will be "net of growth," ROP Plans usually include two primary calculations of VOC and NOx emissions as of the plan milestone date: (1) a projection of emissions growth to include an estimate of uncontrolled emissions as of the milestone date, and (2) an emission target level calculated by subtracting an amount equal to a 9- or 15-percent reduction in the area's 1990 anthropogenic baseline emissions plus any noncreditable emission reductions from the 1990 anthropogenic baseline or the previous ROP target level. The difference between the projected uncontrolled emissions and target level emissions represents the required ROP emission reductions, net of growth.

### *VOC Target Levels Not Met*

Table 3.1 shows projected target levels for VOCs in 15- and 9-percent ROP Plans as compared to VOC emissions per 1996 and 1999 PEIs. Negative differences between the target levels and PEIs for seven nonattainment areas indicate that the growth of projected emissions may have been underestimated and the implemented ROP emission controls and related reductions (to include emissions growth) were

inadequate to achieve the subject target levels. Since the differences between projected uncontrolled VOC emissions and target emission levels for 1996 and 1999 were usually greater than 9 or 15 percent of the ROP baseline inventories, the differences between PEIs and target levels shown in Tables 3.1 and 3.2 may represent an under projection of emissions growth and, therefore, the emission reductions needed by 1996 and 1999 to assure emission reductions of 9 to 15 percent (net of growth). The potential under projections of required VOC reductions ranged from 0.57 to over 104 tons per day (tpd).

**Table 3.1: Differences In VOC Targets and VOC Emissions in PEIs**

| Nonattainment Area | 1996 Target VOC (tpd) | 1996 PEI VOC (tpd) | Difference 1996 Target Less 1996 PEI | 1999 Target VOC (tpd) | 1999 PEI VOC (tpd) | Difference 1999 Target Less 1999 PEI |
|---|---|---|---|---|---|---|
| Atlanta | 444.21 | 548.32 | -104.11 | NA [a] | 433.61 | NA [a] |
| Baltimore | 253.3 | 274.03 | -20.73 | 252.85 | 237.1 | 15.75 |
| Boston-Lawrence-Worcester<br>-Massachusetts<br>-New Hampshire | <br>658<br>40.8 | <br>738<br>41.37 | <br>-80<br>-0.57 | <br>588<br>38.4 | <br>631.74<br>41.98 | <br>-43.74<br>-3.58 |
| Chicago-Gary-Lake County<br>-Illinois<br>-Indiana | <br>857.02<br>137.28 | <br>770.46<br>164.51 | <br>86.56<br>-27.23 | <br>807.82<br>146.01 | <br>685.27<br>Unknown[b] | <br>122.05<br>Unknown[b] |
| Dallas-Fort Worth | 465.52 | 528.46 | -62.94 | 405.54 | 390.74 | 14.8 |
| Washington DC Area | 384.6 | 423.5 | -38.9 | 380.2 | 361.6 | 18.6 |
| Milwaukee-Racine | 288.4 | Unknown[c] | Unknown[c] | 237.57 | 210.6 | 26.97 |
| Portsmouth-Dover-Rochester | 30.3 | 22.25 | 8.05 | 27.9 | 25.65 | 2.25 |
| Providence | 141.5 | Unknown[d] | Unknown[d] | 137.3 | Unknown[d] | Unknown[d] |
| Springfield | 118 | 115 | 3 | 115 | 99.65 | 15.35 |

a Post-1996 ROP Plan did not include VOC reductions. Therefore, no VOC target level was calculated for 11/1999.
b Indiana did not develop a complete 1999 PEI its portion of the Chicago-Gary-Lake County area.
c Wisconsin did not develop a 1996 PEI for the Milwaukee-Racine area.
d Rhode Island did not document/publish 1996 and 1999 PEIs for Providence area; State transmitted data directly to OAQPS.

### *NOx Target Levels Not Met*

For the 10 nonattainment areas, 9 post-1996 ROP (9 percent) Plans included NOx emission controls and related projected emission reductions to be achieved by November 15, 1999. A comparison of 1999 NOx target levels to the relevant 1999 PEI disclosed that for eight ROPs, the ROP NOx target levels were significantly less than the actual NOx inventory reflected in the 1999 PEI. As reflected in Table 3.2, these differences, ranging from 7.08 to over 175 tons per day, may represent under projections of required NOx reductions.

**Table 3.2: Differences In NOx Targets and NOx Emissions in PEIs**

| Nonattainment Area | 1999 NOx Target Level (tpd) | 1999 PEI NOx (tpd) | Difference 1999 Target Less 1999 PEI (tpd) |
|---|---|---|---|
| Atlanta | 439.64 | 614.7 | -175.06 |
| Baltimore | 397.05 | 467.35 | -70.3 |
| Boston-Lawrence-Worcester<br>Massachusetts<br>New Hampshire | <br>828<br>48.2 | <br>914.89<br>41.12 | <br>-86.89<br>-7.08 |
| Chicago-Gary-Lake Cty<br>Illinois<br>Indiana | <br>1820.5[a]<br>NA[b] | <br>1963.49[a]<br>Unknown[c] | <br>-142.99<br>NA[b] |
| Dallas-Fort Worth | NA[b] | 523.84 | NA[b] |
| Washington, DC | 614.7 | 626.4 | -11.7 |
| Milwaukee-Racine | NA | 306.5 | NA |
| Portsmouth-Dover-Rochester | 38.7 | 48.18 | -9.48 |
| Providence | 85.5 | Unknown[c] | Unknown[c] |
| Springfield | 97 | 136.33 | -39.33 |

a Illinois claimed NOx emission reductions for sources outside of the Chicago and East St. Louis nonattainment areas. The "Illinois Attainment Area" 1990 NOx baseline emissions inventory was used as ROP baseline for computing 1999 NOx target level, projected 1999 uncontrolled NOx emissions and required NOx reductions. Therefore, Illinois' 1999 PEI for the Illinois Attainment Area was used to compare to the 1999 NOx target level.

b Indiana and Wisconsin did not include any NOx controls in their post-1996 ROP Plans for the Chicago-Gary-Lake County and Milwaukee-Racine nonattainment areas. Therefore, there were no NOx target levels projected for 1999 in the respective ROP Plans.

c Indiana and Rhode Island did not develop or publish 1999 PEIs for the Chicago-Gary-Lake County and Providence nonattainment areas, respectively; thus, a comparison was not possible for these nonattainment areas.

EPA officials and the staff for Georgia indicated that this condition could have resulted from the use of inaccurate growth rates and factors (such as Vehicle Miles Traveled) in projecting target year emission inventories. A Georgia official indicated that, in addition to incorrect growth factors, the difference between its nonattainment area 1996 VOC target level and the 1996 VOC PEI may be caused by the delayed implementation of ROP Plan controls after the date that such reductions were supposed to have been achieved or differences in models used to estimate emission levels. In one case, a region accepted growth factors used to project ROP target levels that were not supported by past actual growth rates for the area, indicating an inadequate review. In addition, a local planning commission commented that the ROP projections used an outdated estimate of Vehicle Miles Traveled but EPA allowed its use, stating that any under projections could be resolved in subsequent attainment plans. Use of inaccurate growth projections can result in underestimating uncontrolled emission inventories and the amount reductions needed to the meet the Act's requirements. None of the five EPA regions we contacted had performed a comparative analysis of ROP projections and PEIs; thus, they were not aware of the need to implement contingency measures to resolve any under projections of required reductions. Appendix E provides additional information on the growth factors used for the Atlanta area ROP.

EPA did not grant final approval for many of the ROP Plans until after the date that relevant PEIs should have been developed. Under the Act, the 1996 and 1999 PEIs for each nonattainment area were due to be completed by September 1998 and September 2001, respectively. EPA final approvals of the 15-percent ROPs for 8 of 10 nonattainment areas did not occur until after the 1996 PEIs were due. Five of 10 areas received final approval for the 9-percent ROP Plans subsequent to the September 2001 due date. In these instances, there should have been sufficient emissions inventory data developed prior to ROP Plan final approval for EPA regions and States to validate the ROP emission target levels.

## EPA Regions Did Not Always Obtain Adequate Technical Data to Support State Claims for Emission Reductions

Post-1996 ROPs for 3 of 10 nonattainment areas included emission reductions from outside nonattainment area boundaries (see Table 3.3). Such emission reduction credits were permitted under a December 1997 EPA policy memorandum. However, this policy does not preclude double-counting of emission reductions and raises other concerns that are discussed further in Chapter 4. Our contacts with EPA regional officials indicated that the regions had not obtained sufficient technical support or researched available data to ensure that these reductions had actually occurred by November 1999. Our subsequent analysis of 1990 to 1999 NEI data indicated that these emission reductions may not have been obtained for two of the three nonattainment areas. Details follow.

**Table 3.3: Outside Emission Reduction Credits**

| Nonattainment Area | Outside Credits |
|---|---|
| Chicago-Gary-Lake County | 261.97 tons per day NOx |
| Boston-Lawrence-Worcester | 6.0 tons per day NOx |
| Milwaukee-Racine | 6.5 tons per day VOCs |

Two States claimed outside power plant NOx reductions from the Federal Acid Rain program in post-1996 ROPs for two severe nonattainment areas (Chicago-Gary-Lake County and New Hampshire portion of Boston-Lawrence-Worcester). The post-1996 ROP Plans for these two areas received final approval from 1 to almost 3 years after November 1999. Since EPA receives power plant NOx emissions directly from these sources as part of the Acid Rain program, these emissions should have been available for EPA regions to use to verify ROP emission reduction claims prior to ROP final approval. However, one region relied primarily on the State's claims of 40 to 60 percent emissions reductions at specific power plants without verifying the reductions with NEI or other sources of NOx emissions data for these plants. Our analysis of NEI data for 1990 through 1999 NOx emissions for these power plants indicated that the combined NOx emissions had been reduced by only 12.5 percent. Further details on Chicago-Gary-Lake County are in Appendix F.

Only one State (Wisconsin) claimed VOC emission reductions outside of the nonattainment area boundaries. In the post-1996 ROP for the Milwaukee-Racine nonattainment area, Wisconsin claimed a 20 to 37 percent[8] (6.5 tons per day) reduction in VOC emissions for specific VOC source categories between 1990 and 1999 related to State rules for autobody refinishing, degreasing, and organic solvent use in 14 counties outside the nonattainment area. However, our analysis of NEI data for 1990 through 1999 VOC emissions (overall and category specific) indicated that the VOC reductions claimed by the State for the 14 counties were not achieved because the NEI data showed only an 8.2-percent decrease in total VOC emissions between 1990 and 1999 for the 14-county area. Further, a comparison of 1990 and 1999 NEI data for VOC emissions from solvent utilization within the 14-county area indicated that solvent VOC emissions increased from 42,252.81 to 43,053.01 tons per year, a 1.17 percent increase.

## EPA Suspended Requirement for Post-1996 ROP Plans and Related 3-Percent Reduction for Six Serious Non-Attainment Areas

In March 1999, EPA promulgated a policy[9] that allowed extension of the November 1999 attainment date for serious nonattainment areas under post-1996 ROP Plans, without elevating these areas to the next higher nonattainment classification, if the nonattainment areas were impacted by ozone transport. This policy was contrary to the Act, which requires that nonattainment areas be elevated to the next level if they do not attain the ozone standard by the statutory attainment date. Such an elevation requires more stringent emission control measures.

Six of 14 areas classified serious prior to 2003 had not attained the 1-hour ozone standard by November 1999, and had been either proposed for approval or received final approval for attainment date extensions under this policy. Even though the attainment dates for the six areas were extended to between 2003 and 2007, EPA regions did not require that the SIP revisions related to the attainment date extensions include requirements for ROPs or for demonstrations of the annual 3-percent reductions of precursor emissions after 1999. These areas were already struggling to achieve the 1-hour standard when EPA suspended the requirement for ROPs and minimum annual emission reductions.

Such extensions may have precluded or prolonged the planning and implementation of additional emission controls needed to facilitate attainment and improve air quality in these areas. Additional 9-percent reductions (3 percent per year) in precursor emissions would have been required by November 15, 2002,

[8]Estimated percent emissions reductions ranged from 20 to 37 percent depending on the category involved (autobody refinishing, degreasing operations, or organic solvents).

[9]Federal Register Volume 64, pages 14441-14444, dated March 25, 1999, titled *Extension of Attainment Dates for Downwind Transport Areas.*

and November 15, 2005, if these areas had been reclassified to severe nonattainment.

Attainment date extensions for three serious areas were legally challenged. These extensions were either reversed by Federal court decisions or EPA voluntarily reclassified these areas to severe before an adverse court ruling could be issued. In each case, Federal courts ruled or indicated that such attainment date extensions without elevation to the next higher level of nonattainment were not authorized by the Act. The courts also ruled that suspension of ROP requirements and related 3-percent annual precursor emission reductions were also not within the intent or authorization of the Act.

Table 3.4 includes the serious nonattainment areas that received proposed or final approval of attainment date extensions under the March 1999 policy. None of the areas promulgated ROP Plans for periods subsequent to 1999 despite the attainment date extensions.

**Table 3.4: Attainment Date Extensions and Suspension of ROPs**

| Serious Nonattainment Area | Extended Attainment Date | Date Extension Approved/ Proposed | Current Status |
|---|---|---|---|
| Atlanta | 11/15/2004 | 05/07/2002 | Remanded to EPA by Federal court. Elevated to severe in 2003. |
| Baton Rouge | 11/15/2005 | 10/02/2002 | Extension overturned by Federal court. Elevated to severe in 2003. |
| Dallas-Fort Worth[a] | 11/15/2007 | 01/16/2001 | Proposed approval. No final approval. Still classified serious. |
| Greater Connecticut | 11/15/2007 | 01/03/2001 | No legal challenge. Still classified serious. |
| Springfield | 11/15/2003 | 01/03/2001 | No legal challenge. Did not attain by 2003 but still classified serious. |
| Washington DC | 11/15/2005 | 01/03/2001 | Extension overturned by Federal court. Elevated to severe in 2003. |

a Because of adverse court rulings related to attainment date extensions under the March 1999 policy, Region 6 did not issue a final approval of the extension for the Dallas-Fort Worth area, since a final approval would permit the extension to be legally challenged. However, Region 6 has not elevated Dallas-Fort Worth to severe nonattainment as required by the Act. The Dallas-Fort Worth area has been in "limbo" since January 2001, when approval of the extension was proposed and, thus, has received a "defacto" attainment date extension for over 3 years that cannot be legally challenged.

## Insufficient EPA Oversight Contributed to Delays in ROP Plans and Implementation of Controls

As noted above, delays in ROP Plans and implementation of required emission controls can be attributed to a variety of reasons, including insufficient EPA oversight of ROP Plan development; changes in EPA guidance on major emission controls, especially the vehicle I&M program; and extended ROP milestone dates

for achievement of emission reductions required in the Act (see Appendix D). Other reasons for delays include the fact that EPA headquarters and regional officials:

- Allowed States extensive periods of time (up to 8 years) to develop acceptable ROP Plans and make changes to draft plans. EPA took extensive time to review and/or approve ROP Plans or ROP changes by States.

- Did not consistently review assumptions/projections used in ROP Plans and challenge questionable projections of future inventory levels.

- Did not compare projected emission levels in ROPs with actual inventories subsequently developed to ensure that adequate emission controls were implemented.

- Did not obtain sufficient supporting documentation for emission reductions claimed by States in ROP Plans.

- Allowed emission reductions in ROP Plans for Federal VOC rules that were not promulgated or effective until 3 or more years after the ROP milestone date for achieving these VOC reductions.

- Suspended ROP development when areas temporarily attained the 1-hour standard before again violating the standard (see also Appendix D).

- Suspended requirement for post-1996 ROPs related to six serious nonattainment areas whose attainment dates were either extended or proposed to be extended beyond November 1999.

## Conclusions

EPA did not effectively oversee the development of ROP Plans under the 1-hour standard to ensure that (1) ROPs were developed and implemented within the time frames required by the Act, (2) required emission reductions were achieved by the milestone dates specified in the Act, and (3) projected emission levels and emission reductions were correct and properly supported. EPA should not suspend requirements for ROPs and related minimum annual emission reductions. Once air quality data indicate that an area has achieved the standard, the permanence of the achievement should be supported with meteorologically adjusted trend analysis of ambient ozone observations and analyses of trends in ambient concentrations of VOCs and NOx for the nonattainment area.

Implementation of the 8-hour standard effectively doubled the number of ozone nonattainment counties. EPA needs to improve its oversight of the 8-hour SIPs to include the development and approval of ROP Plans and subsequent State

implementation of emission controls to ensure that the 8-hour ROPs are accurate, developed and approved in a timely manner, and implemented within the ROP milestone dates established in the Act and EPA regulations. EPA should require States to provide adequate documentation of emission projections claimed, including projected VOC and NOx target levels.

## Recommendations

We recommend that the Assistant Administrator for Air and Radiation:

3-1 Develop oversight procedures and guidance that will expedite development, approval, and implementation of ROP Plans and related emission controls.

3-2 Require evaluation of proposed ROP Plans by EPA regional air programs to assure the propriety of ROP assumptions, projections, and related emission reductions in comparison to available emission databases and historical data.

3-3 Develop guidance for analyzing and comparing periodic emission inventories to projected emission target levels and evaluating assumptions used in applicable ROP Plans, in order to: (1) reconcile differences between projected and actual inventories; (2) identify any incorrect assumptions or projections and understatement of needed emission reductions; and (3) establish improvements that may be needed in the ROP development process, and ensure training of staff in conducting these analyses.

3-4 When EPA staff determine that an underestimation of emission reductions needed to meet the ROP target level has occurred, require States to implement contingency or other measures needed in a timely manner to ensure that required emission reductions are achieved.

3-5 Revise EPA's "Clean Data" policy to require meteorologically adjusted ozone trend analyses and trend analyses of ambient VOC and NOx concentrations for nonattainment areas that attain the ozone standard based on ambient ozone monitoring data, to better assure the permanence of such attainments before suspending ROP Plan development and approval.

3-6 Require that EPA make and publish a determination that the ozone standard has been achieved through permanent and enforceable emission reductions before suspending ROP Plans and related emission reductions required by the Act.

## Agency Comments and OIG Evaluation

For Chapter 3, the Agency's response generally addressed the recommendations presented in the chapter. The Agency indicated actions were being contemplated or planned in regard to Recommendations 3-1, 3-3, 3-5, and 3-6. The Agency's comments regarding Recommendation 3-2 generally were non-responsive and provided no actual planned corrective actions. Comments on Recommendation 3-4 did not address the content of this recommendation and provided no planned or contemplated corrective actions. EPA's response also suggested several technical corrections to certain statements in the section related to differences between ROP target levels and PEIs. Changes were made to clarify these statements. The Agency's responses regarding Chapter 3 and our detailed evaluation of these responses are included in Appendix H.

# Chapter 4
## EPA Policy Allowing Outside Emission Reduction Credits Creates Inequities and Hampers Attainment

In 1997, EPA issued an ozone policy[10] intended to grant States greater flexibility in obtaining precursor emission reductions by allowing them to claim emission reductions from sources outside of their nonattainment areas for post-1996 ROP Plans. However, as designed, the policy creates potential inequities between nonattainment areas, allows for double-counting of the same facility's emissions, and is not based on scientific modeling of emissions impact. Additionally, the statutory basis for the policy is unclear, EPA has expressed differing positions regarding the legal basis for the policy, and the policy was not subjected to rulemaking and public comment. Of most concern is that the policy can lead to fewer emissions reductions for areas that use the policy to claim outside emission reductions. Our review of post-1996 ROP Plans for the 10 serious nonattainment areas showed that three areas included credit for emission reductions outside of the nonattainment areas, but it is not clear that the claimed emission reductions for two areas were actually achieved.

### Policy Creates Inequities, Allows Double-Counting, and May Not Achieve Emission Reductions Net of Growth

The policy allowing nonattainment areas to "pick" outside sources for credit in ROP Plans allows these areas to ignore other sources from outside areas that may produce emissions that offset reductions. For example, one outside electric utility that had reduced emissions may be included in the ROP baseline, but another outside utility within the same specified area that had increased emissions may, under EPA's 1997 policy, be ignored. In addition, not including all outside source baselines in the ROP calculations can result in emission reductions that are less than needed to meet the Act's "net of growth" requirement.

To ensure that emission reductions are net of growth, the Act specifies that the calculation of required reductions is to include the anthropogenic VOC (or NOx) baseline emissions for all sources within the nonattainment area, once adjustments for noncreditable reductions are accounted for (generally involving reductions from certain pre-1990 emission controls). EPA often refers to this adjusted nonattainment baseline as the adjusted "ROP baseline."

[10]Memorandum from Acting Assistant Administrator for Air and Radiation to Regional Administrators, "Guidance for Implementing the 1-Hour Ozone and Pre-Existing PM10 NAAQS," issued in December 1997.

The 1997 policy allows nonattainment areas to include in ROP baseline emissions only the baseline emissions for the specific sources or source categories for which outside emission reduction credit is being claimed. Exclusion of baseline emissions for the entire outside area from the ROP calculation does not ensure that emissions within and outside the nonattainment area are being reduced net of growth as required by the Act. Under the policy, there is no assurance that excluded outside sources have not increased their emissions to an extent that offsets or exceeds the emission reductions of the selected sources or source categories. In addition, allowing States to "pick and choose" specific outside sources and only include the baseline emissions for these selected sources in calculating required reductions creates an inequity between nonattainment areas that reduce emissions within the nonattainment area and nonattainment areas that include selected outside sources.

Nonattainment areas that limit emission controls to the nonattainment area are required to calculate the required reductions based on the entire nonattainment area baseline of VOC and/or NOx emissions. However, nonattainment areas that choose specific outside sources for emission credit only have to calculate reductions against the baseline for these specific sources and not the baseline for the entire outside area. Since the required reduction of 9 percent is applied to the baseline used, this condition may result in less emission reductions for those areas that choose to calculate reductions based on the baselines of specific outside sources.

The Act specifies that the 9-percent emission reduction is the minimum requirement. Required reductions are supposed to eliminate emission growth plus an additional 9-percent reduction from the baseline emissions. As a result, most ROPs include emission reductions substantially more than the 9-percent minimum requirement in the Act. Including only the baseline emissions for selected outside sources in ROP calculations may result in a 9-percent reduction – net of growth – for these particular sources, but not a reduction net of growth for the nonattainment area or the outside areas as a whole.

Post-1996 ROP Plans for two of the three nonattainment areas claiming outside emission reductions included only the baseline emissions for the selected sources in calculating required emission reductions. The ROP for the third nonattainment area included emission baselines for the entire outside area where emission reductions were claimed. Details on the three areas are in Appendix G.

### *Policy Does Not Preclude Double Counting*

Currently, a number of States have multiple nonattainment areas under the 1-hour standard, and the number of nonattainment counties more than doubled with implementation of the 8-hour standard in April 2004. However, EPA's 1997 policy does not safeguard against two or more nonattainment areas improperly claiming the same outside emission reduction credits in their individual ROP

Plans. If two or more nonattainment areas claim benefit from emission reductions by the same outside source, the State needs to prove that all of the areas received an emissions benefit and the estimated extent of benefit received. In our opinion, areas should not be allowed to claim the total emissions reduced but only receive the extent of emissions benefit on its ozone levels. To show the benefit and impact of outside emission reductions on individual nonattainment areas would require atmospheric modeling; however, the current policy does not require such modeling as a condition of this claim.

### *Policy Inhibits Ability to Use Periodic Emissions Inventory Data to Assess Control Strategy Effectiveness*

The 1990 Amendments to the Act required that a 1990 baseline emissions inventory for each nonattainment area be developed and updated for every 3-years thereafter. Although the Act did not require that the PEI be used to assess control effectiveness, OAQPS and State officials said they believed that the PEIs were to be used to measure emission reductions achieved by nonattainment areas. A PEI for all nonattainment areas was required for 1999. However, EPA staff and our comparison of 1999 PEIs to post 1996-ROP baseline emissions for the three nonattainment areas that claimed outside emission reductions indicated that the outside sources or areas for which emission reductions were taken were not included in the 1999 PEIs. In these three cases the PEIs were limited to VOC and NOx emissions within the nonattainment areas. As a result, there was no correlation between the post-1996 ROP baseline emissions (used to determine the emission reductions to be accomplished by November 1999) and the 1999 PEI.

This occurred because EPA's policy allows nonattainment area credit for outside emission reductions without requiring that outside areas or sources claimed in post-1996 ROPs be included in subsequent PEIs. This requirement would facilitate comparison of PEIs to ROP emission target levels as a measure of the effectiveness of ROP controls in reducing emissions.

### *Selection of Outside Emission Sources Not Based On Modeling*

Selection of outside emission sources for emission reduction credit is not based on a scientific method, such as atmospheric modeling of emission transport. Instead, the policy is based on distance from the nonattainment area boundary. For example, the distance limit for VOC reductions is 100 kilometers outside the nonattainment area boundary. For NOx, it is 200 kilometers, unless the State was a core State[11] in the Ozone Transport Advisory Group study, in which case NOx reduction credit may be expanded to the whole State.

[11]Alabama, Connecticut, Delaware, District of Columbia, Georgia, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, West Virginia, and Wisconsin.

When the policy was issued in 1997, atmospheric modeling was expensive and resource intensive. The policy was originally based on a Federal Advisory Committee Act committee recommendation to EPA. According to committee members, States wanted an alternative to modeling, so EPA had an environmental engineer and modeling expert judgmentally set distances that States could use in lieu of modeling. Atmospheric modeling experts on the FACA committee said the distance limits are not strictly supported by science, and that modeling is the only scientific method to identify emission sources that contribute to a nonattainment area's zone levels. One of the modeling experts said the distance limits are arbitrary limits that may or may not include sources that most impact an area's attainment of the ozone standard. The expert further stated that atmospheric modeling is no longer costly and resource intensive, and can be run on laptop computers.

## Legal Basis of Policy Not Clear

Section 182(c)(2)(B) of the Act states that the post-1996 ROP Plans shall reduce by 9 percent "baseline emissions," and defines "baseline emissions"' to mean the total amount of actual VOC emissions from anthropogenic sources within the nonattainment area. Section 182(c)(2)(C) also provides that NOx reductions can be substituted for or combined with VOC reductions, since both contribute to ozone, a requirement that EPA lawyers said was clear and legally supportable. During our interview with EPA Office of General Counsel Air and Radiation attorneys, the attorneys could not find any language in Section 182 (c)(2)(1)(B) restricting NOx substitution to the nonattainment area baseline emissions or any reference to Section 182(b)(1)(B) that contains that limitation.

The legal basis is more ambiguous, however, when it comes to non-attainment areas counting VOC emission reductions occurring in areas outside of their boundaries toward ozone attainment goals. EPA attorneys told us that the statute allowing NOx substitution for VOCs allows reasonable further progress plans to include a combination of NOx and VOCs reductions. They also said that the Act does not state that the VOCs combined with NOx are subject to the same restrictions as the 9-percent VOC reductions specified in Section 182(c)(2)(B). However, the one nonattainment area ROP Plan that claimed outside VOC reductions (Milwaukee-Racine area) did not include NOx substitution. The post-1996 ROP plan contained only VOC control measures. One attorney also referred us to the general reasonable further planning requirements in Section 172 that do not refer to restricting VOC reductions to nonattainment area baseline emissions. However, the Section 172 contains no specific VOC reduction requirements. The basis of both VOC and NOx reductions required in post-1996 ROPs is contained in Section 182(c)(2)(B). This section requires that post-1996 ROPs contain a minimum 9-percent reduction in VOC baseline emissions. As previously stated,

the 9-percent reduction is further referenced to Section 182(b)(1)(B), which restricts such emission reductions to nonattainment area baseline emissions.

In each post-1996 ROP Federal Register notice we reviewed, Section 182(c)(2)(B) was cited as the basis of the required amount of either VOC or NOx reductions included in the plans. For example, the Illinois post-1996 ROP for the Chicago-Gary-Lake County severe nonattainment area, which claimed 261.97 tons per day in NOx reductions for sources outside the nonattainment area, cited the ROP Plan Section 182(c)(2)(B) as the basis of the required amount of precursor reductions:

> *The plan was submitted to meet the Act's requirement, in section 182(c)(2)(B), that the State demonstrate a 9 percent reduction of VOC emissions in the Chicago ozone nonattainment area for the 3 year period between 1996 and 1999.*

Whether an ROP includes only VOC reductions, NOx reductions, or a combination of VOC and NOx reductions, the minimum amount of required reductions is determined under Section 182(c)(2)(B), which requires that VOC reductions be within the nonattainment area baseline emissions.

The EPA attorneys we contacted said that a person could reasonably interpret the "substitution" of NOx for VOCs as carrying the same restrictions. Also, they said that a person could reasonably interpret that the VOC reductions used in combination with NOx reductions in a reasonable further progress plan are the same VOC reductions cited in Section 182(c)(2)(B), and these reductions would, therefore, be limited to reductions in the nonattainment area baseline emissions. EPA's response to the OIG's draft report, included as Appendix H to this report, stated that Office of General Counsel attorneys are responsible for advising program offices on the legalities of various issues, such as the policy for outside emission reduction credit, and providing their opinion on whether the policy or guidance in question could be successfully challenged in court. A senior OAQPS official said the policy was probably not explicitly authorized by the Act but that EPA has to make policy decisions in such gray areas to provide flexibility to State and local programs.

### *Policy Not Subjected to Rulemaking or Public Comment*

EPA's "Substitution of Credits for ROP Emission Reductions" was never subjected to rulemaking procedures or public comment, nor was it issued as more formal policy guidance. The outside emission credit policy was included in an attachment to a policy guidance memorandum issued in December 1997. EPA subsequently issued a Notice of Availability in the Federal Register (Vol. 63, page 8196, February 18, 1998), but the Notice did not include the specific guidance involved and did not seek stakeholder opinions or public comments.

### *Policy May Be Inconsistent With Original Purpose*

As previously stated, this policy was based on a Federal Advisory Committee Act committee recommendation to EPA. Two committee members told us that the original intent of the recommendation was to broaden emission controls to areas outside of nonattainment area boundaries in order to address sources that impacted a nonattainment area. However, the subsequent policy allows nonattainment areas to claim emission reductions that have already occurred under other Federal and State regulations. Because the reductions in these areas have already occurred, they do not represent a broadening of nonattainment area controls and neither facilitate nor accelerate attainment. One of the committee members interviewed told us that the policy, as written, appears to be a mechanism to allow States "cheap" emission reduction credits for meeting the required reductions in post-1996 ROP Plans. A senior OAQPS official also recalled that the purpose of the policy was to broaden controls, but he said it was not EPA's intention that the policy be limited to new controls or the broadening of current controls, or that outside reductions should accelerate attainment.

## Conclusions

The legal basis of the policy allowing States to claim outside emission reductions in post-ROP Plans is ambiguous, and appears to conflict with the emission reduction requirements for post-1996 ROP Plans. Because of its potentially harmful impact on ozone precursor emissions, the policy – if continued – should be subjected to the notice-and-comment rulemaking process to provide the public with an opportunity to comment on the merits of the policy. In our view, if this policy is to continue, revisions are needed. At a minimum, a revised policy should: (1) encourage the broadening of emission controls to outside sources; (2) require atmospheric modeling rather than arbitrary distances; (3) ensure that outside emission reductions represent appropriate reductions, net of growth; and (4) require that the baseline emissions from all outside areas (from which credits are claimed) be used to calculate the required emission reduction amount for post-1996 ROPs. Also, the policy should specify how outside emission reductions would be apportioned among multiple nonattainment areas to preclude double-counting, and that outside areas/sources be included in subsequent PEIs.

## Recommendations

We recommend that the Assistant Administrator for Air and Radiation:

4-1 Subject the policy claiming outside emissions to the notice-and-comment rulemaking process, which will allow broad public comment and feedback.

4-2 Revise policy for nonattainment area outside emission reduction credit to:

a. Encourage broadening of controls for sources in outside areas in order for a nonattainment area to claim emission reduction credits.

b. Require atmospheric modeling to support the impact of outside emissions and sources on nonattainment area ozone levels.

c. Require that the emission baselines from all selected outside areas be included in ROP baseline emissions for calculating required emission reductions and measuring achievement of reductions.

d. Establish a methodology, such as atmospheric modeling, to document the extent of benefits that NOx and VOC emissions reductions from outside the area have on individual nonattainment areas to prevent improper double-counting of emission reductions when a State has multiple nonattainment areas.

e. Require that outside sources or areas included in post-1996 ROPs also be included in subsequent PEIs for each applicable nonattainment area.

## Agency Comments and OIG Evaluation

The Agency's response generally addressed recommendations presented in Chapter 4.

In regard to Recommendation 4-1, the Agency contends that each Federal Register Notice for ROPs that include credit for outside emission reductions allows public comment on the policy that allows these credits. We agree that ROP notices could provide a forum for public comment; however, this has not been the case for prior notices that included credit for outside emission reductions. These notices only referenced the policy and provided little or no details regarding the policy and the statutory basis for the policy under the Act. Additionally, ROP notices were normally long, complex documents, and the use of outside emission reductions and the references to the policy were difficult to ascertain within this document. While we acknowledge that it is possible, we do not believe that past ROP notices appropriately highlighted nor presented sufficient information for a meaningful public discourse on the subject policy and its ramifications. Therefore, the OIG continues to believe that the policy should be subjected to public comment in an open, transparent, and equitable manner.

The Agency indicated that it would consider the various components of Recommendation 4-2 during its assessment of existing policies and guidance as part of the rulemaking process for implementation of the 8-hour standard. EPA's response also requested an editorial change related to certain statements attributed to EPA's Office of General Counsel attorneys as shown in the draft report. The

statements were changed as requested. Details of changes requested by EPA and OIG's related changes to the final report are shown in Appendix H.

# Chapter 5
## Reliable Processes Needed to Measure Overall Emission Reductions and Related Impacts

In the 14 years since passage of the 1990 Amendments to the Act, EPA has not issued rules requiring States to demonstrate their progress toward reducing precursor emissions, nor has EPA issued guidance on how such demonstrations should be conducted, despite the Act's mandate to do so. Review of 10 serious and severe ozone nonattainment areas indicated that EPA and States had no reliable methods to assess the overall success of State emission reduction programs. EPA regions and States either did not measure reductions by individual nonattainment areas, or used methods that were unreliable, erroneous, or did not demonstrate achievement of reductions. According to OAQPS officials, guidance that would incorporate the Act's timeframes could not be developed, so no guidance was issued. Also, due to the lack of goals and performance measures (see Chapter 7), there was little incentive for EPA to promulgate the guidance or ensure that States measured their progress. Consequently, EPA and States have not adequately measured the effectiveness of nonattainment area emission controls and whether emissions have been progressively reduced as required by the 1990 Act. More importantly, EPA is unsure whether recent changes in ozone levels are the result of permanent reductions in precursor emissions or the result of other factors, such as changes in weather or economic trends.

## 1990 Act Required Measurement of Emission Reductions

The 1990 Act requires each State to submit a Compliance Demonstration within 90 days after each ROP Plan milestone date that demonstrates that the required emission reductions have been achieved. According to the compliance demonstration provisions of Section 182(g)(2),

> *For each nonattainment area referred to in paragraph (1), not later than 90 days after the date on which an applicable milestone occurs (not including an attainment date on which a milestone occurs in cases where the standard has been attained), each State in which all or part of such area is located shall submit to the Administrator a demonstration that the milestone has been met.... The Administrator shall determine whether or not a State's demonstration is adequate within 90 days after the Administrator's receipt of a demonstration which contains the information and analysis required by the Administrator.*

The Act further provided that if a State could not adequately demonstrate that the required emission reductions were achieved, the State could be subject to enforcement actions or sanctions.

## EPA Did Not Issue Rules or Guidance for Compliance Demonstrations

EPA refers to the compliance demonstrations required by the Act as "milestone compliance demonstrations." However, according to interviews of air program officials at OAQPS, five EPA regions, and two States, EPA never issued rules requiring States to perform milestone compliance demonstrations, and has never issued guidance as to what information and analyses these demonstrations should contain. As a result, milestone compliance demonstrations have not been completed for most nonattainment areas. For the 10 nonattainment areas included in our review, only 3 milestone compliance demonstrations had been submitted by 2 States (Georgia and Illinois) for 2 nonattainment areas (Atlanta and Chicago-Gary-Lake County). Further, these three compliance demonstrations generally contained only a listing of emission controls, the dates that controls were implemented, and the assumption that projected emission reductions were equivalent to actual reductions. The three milestone compliance demonstrations we reviewed did not contain any measurements of actual emission reductions. EPA regional staff indicated that the regions did not review these milestone compliance demonstrations because EPA had not issued any guidance on what they should contain.

OAQPS staff explained that milestone compliance demonstration rules and guidance had initially been drafted around 1994, but – because of a "disconnect" in the Act's requirements – OAQPS could not develop guidance that met the Act's requirements, so the guidance was never issued. According to OAQPS officials, their interpretation of the 1990 Act is that a comparison between the 1990 baseline emission inventory and subsequent periodic emissions inventories should be used in State compliance demonstrations to demonstrate actual emission reductions achieved. Milestone compliance demonstrations are required from States 90 days after each milestone date, but periodic emission inventories are not due until 22 months after the milestone dates. Thus, updated emissions inventories are not available when States need them to create their milestone compliance demonstrations.

According to OAQPS officials, EPA attorneys would not approve a milestone compliance demonstrations policy that did not meet the Act's 90-day time frame. OAQPS developed some alternative indicators States could use to demonstrate that emission reductions were probably achieved, but this did not satisfy EPA managers who wanted actual measures of reductions. OAQPS officials were asked if statutory changes in the Act's requirements were sought to remedy the timeframe inconsistencies, to which they replied recommendations on statutory

changes could only come from the Assistant Administrator level and no such recommendations had been made.

## Baseline and Periodic Inventories Needed Updating

While EPA's periodic updates to emissions models, methodologies, and factors since 1990 have helped improve the quality of more recent emissions inventories, substantial effort is required to update older baseline inventories. This will require EPA to revisit early assumptions and retrofit newer methodologies to old activity profiles. As a result, it becomes more and more difficult, costly, and resource intensive to maintain early baseline inventories and, as such, more difficult to use them to measure emission reductions. OAQPS staff stated that the intent of the Act was that baseline and PEI inventories be used by nonattainment areas to gauge their emission reduction progress. However, the Act does not specifically require that emission inventories be used for this purpose. Our interviews with OAQPS, regional, and State officials disclosed that, due to changes in models, methodologies, and emissions factors over the years, a reliable comparison between baseline and periodic emission inventories could not be conducted unless both inventories were updated.

Five EPA regions we contacted said they had not required States to update their nonattainment area baseline or periodic emission inventories. OAQPS staff indicated that EPA had not required the updating of baseline inventories because such updating required modeling, which proved expensive and resource intensive in past years. However, some States voluntarily updated their baseline inventories in 2003 using the latest mobile emission model (MOBILE6), and one State (Wisconsin) had updated the 1990 baseline inventories and the periodic emission inventories for its one nonattainment area. Also, one State (Maryland) had attempted to measure actual emission reductions in its 1996 and 1999 PEIs by comparing the current PEI to the 1990 baselines for its nonattainment areas, but the baseline inventories had not been updated or adjusted for noncreditable emission reductions as required by the Act. Maryland did not submit this attempted emission reduction measurement as a milestone compliance demonstration.

## EPA Regions and States Primarily Used Ambient Trends and Implementation of Controls to Demonstrate Progress

Our interviews at six EPA regions and two States indicated that they used a combination of ambient ozone trends, ozone exceedance days, and implementation of ROP emission controls to gauge reduction of ozone precursor emissions. EPA regions and States generally used the projected emissions reductions from implemented controls as a measure of progress in reducing precursor emissions.

EPA established "observed ozone levels" as an outcome measure for its ozone precursor emission reduction program. However, because ozone is not emitted, but formed in a complex, atmospheric chemical reaction of other emitted pollutants, no direct correlation exists between ozone levels and the reduction of precursor emissions. The impact of emission reductions on ozone levels is generally estimated through use of atmospheric models that include additional factors that affect ozone levels, such as meteorological conditions, temperature, and wind velocity.

For example, EPA and external studies of recent downward trends in nonattainment ozone levels pointed to weather conditions (cooler summers and more rain than usual), in addition to emission reductions, as the primary reasons for reduced ambient ozone levels. In addition, an EPA study and one Georgia study of meteorologically adjusted ozone levels for major metropolitan areas found no statistically significant downward trends in ozone concentrations in the periods 1990-2002 and 1981-2001, respectively. Further, an OAQPS analysis of 1991-2001 ambient VOC and NOx concentrations for two ozone nonattainment areas found no statistically significant downward trends in ozone or VOC and NOx concentrations resulting from emission reductions. Further, a 1996 study[12] by two OAQPS ozone experts stated the following:

> *Tracking progress in attaining the ozone NAAQS (National Ambient Air Quality Standards) is often confounded by the effect of interannual variations in meteorological conditions, which, in turn, affect the annual (seasonal) distribution of ozone. Large interannual variations in meteorology can thus mask the underlying trends in ozone levels and may suggest changes in air quality that are not actually related to emission reductions.*

However, changes in meteorological conditions and wind patterns can be temporary and generally cannot be controlled; reduction of precursor emissions is the only known method for permanently reducing ozone pollution.

## Guidance and Rules for Compliance Demonstrations May Be Issued for 8-Hour Standard

Although the 1994 initial draft guidance has never been issued, EPA has begun updating the guidance as part of the implementation guidance for the new 8-hour ozone standard. In April 2004, an OAQPS official told us that the guidance might be issued in 2004, but could be delayed because of other priorities related to 8-hour implementation.

[12] "Assessment of Interannual Ozone Variation in Urban Areas From A Climatological Perspective," published in the Atmospheric Environment, Vol. 30, No. 14, pp 2615-2625, 1996.

The draft milestone compliance demonstration guidance indicates that comprehensive emission inventories are the most effective method for assessing emission reductions, but acknowledges that this method may not be accomplished within the Act's 90-day deadline. As a result, EPA proposed an alternative method that uses a "weight of evidence" approach whereby States must provide evidence that control measures specified in their ROPs have been properly implemented, and a best estimate of emission reductions achieved based on growth rates, air quality trends, and other factors. This approach allows ambient air monitoring and emission/air quality modeling as support for emissions reductions. However, as previously discussed, ambient ozone levels alone are not an accurate measure of emission reductions. The draft milestone compliance demonstration guidance does not require the use of relevant factors, such as meteorology-adjusted ozone trends, or trends in ambient concentrations of VOCs and NOx, as indicators of emission reductions. Including these would be beneficial.

## Conclusions

EPA and States need reliable methods for measuring emission reductions of nonattainment areas and the impact of such reductions, excluding other factors, on ambient ozone levels. Without reliable measurement methods, EPA is unable to determine the effectiveness of implemented controls and has no assurance that the progressive emission reductions occurred.

Demonstrations of emission reductions have become increasingly important since implementation of the stricter 8-hour standard and the lack of reasonably available, proven control techniques for some areas. Most 1-hour nonattainment areas, which are now 8-hour nonattainment areas, have already implemented most of the readily available, least expensive emission controls. These areas will need to be innovative in developing and promulgating future control measures. Accordingly, EPA needs to know whether these controls are effective in achieving required reductions and, thereby, facilitate attainment of the 8-hour standard within the time frames established for each area.

## Recommendations

We recommend that the Assistant Administrator for Air and Radiation:

5-1 Expedite issuance of the milestone compliance guidance, but restrict the use of observed ambient zone levels as a stand-alone indicator of emission reductions. The guidance should also require the use of meteorologically adjusted ozone trends and trends in ambient concentrations of VOC and NOx in the weight of evidence approach.

5-2 Instruct States to utilize indicators, as reflected in the draft milestone compliance demonstration guidance, and/or provide annual updates to emissions inventories (one third of sources per year or one third of States per year) to determine potential or actual emission reductions within the Act's 90-day time frame for milestone compliance demonstrations.

5-3 Require that nonattainment areas update baseline inventories and, subsequently, perform more in-depth assessments of actual emission reductions, once the applicable PEIs are completed. This subsequent determination of actual emission reductions may not meet the milestone compliance demonstration 90-day time frame but will provide a measure of progress that is not currently available.

5-4 Incorporate the use of updated NEI data and other available measures, where appropriate, into milestone compliance demonstration guidance as top-down indicators or measures of nonattainment area progress in reducing precursor emissions.

5-5 Require State and local agencies to update past baseline and periodic emission inventories based on the latest models, emission factor, and methodologies, and complete milestone compliance demonstrations for 1990 through 1999 (or later milestone year) for nonattainment areas based on the issued milestone compliance guidance. Further, for future inventories, require States to continuously update inventories as new emissions data and methods are developed, to provide timely assessments of nonattainment area progress in reducing precursor emissions.

## Agency Comments and OIG Evaluation

The Agency indicated that it would evaluate the current draft milestone compliance guidance and determine the feasibility of incorporating the changes recommended in Recommendations 5-1, 5-2, and 5-4. Regarding Recommendations 5-3 and 5-5, the Agency questioned whether the updating of baseline inventories for comparison with future PEIs (Recommendation 5-3), and the updating of baseline and periodic inventories to measure emission reductions achieved by nonattainment areas between 1990 and 1999 (Recommendation 5-5), represent an effective use of Agency resources. The Agency stated that the current focus of ozone program resources is on implementation of the more protective 8-hour ozone standard. The Agency response further noted that EPA and States will rely on indicators included in the draft milestone compliance guidance to determine whether emission reductions were achieved without any requirement for measurement of actual reductions through the use of NEI or State emission inventories for each nonattainment area.

We agree that the Agency should focus resources on implementation of the 8-hour standard. However, as noted here and in Chapter 2, EPA's efforts to implement the 8-hour standard will be significantly enhanced if the Agency better understands the effectiveness of prior precursor emissions reductions strategies. This should help the Agency properly design and effectively implement emission controls under the 8-hour standard. These efforts may be especially important for those major metropolitan areas that have made so little progress in reducing ozone precursor emissions since 1990. In our view, determining how to implement the 8-hour standard more effectively than occurred under the 1-hour standard represents an effective use of Agency resources. Also, the additional milestone requirement for States to update past baseline and/or periodic inventories for comparison to the most recent PEI would provide a realistic measure of emission reduction achievements under the 8-hour standard and, as such, would also represent an effective use of Agency resources to achieve the 8-hour standard. The use of indicators alone will not fully meet the Act's requirement that States demonstrate the attainment of specific, mandated precursor emission reductions for each nonattainment area. The Agency's specific responses to each recommendation in this chapter and a detailed OIG evaluation are included in Appendix H.

# Chapter 6
## Opportunities Exist to Enhance Measurement of Emission Reductions and Ozone Trends

EPA could make better use of available data and methodologies to more accurately assess the effectiveness of emission controls and their impact on ozone levels. Our interviews with OAQPS staff and EPA officials in five regions disclosed that relatively little use has been made of available emissions data, meteorologically adjusted ozone methodologies, and ambient precursor monitoring data to develop long-term trends and assess the actual emission and related ozone reductions for individual nonattainment areas. Greater use of these data and techniques would enable EPA and States to more readily recognize shortcomings of current control mechanisms and help them to develop and implement contingency plans when necessary, and better protect the public from unhealthy ozone. OAQPS officials agreed that this would be a valuable tool, but said that resource constraints had prevented more extensive trend analyses of ozone precursor (VOC and NOx) monitoring data.

### Updated NEI Could Represent A More Consistent Measure

In 2003, EPA initiated an update of 1990 through 1999 NEI data based on EPA's latest models, emission factors, and methodologies. Because in most cases the data have been adjusted for State-developed inventories,[13] the NEI could be used to accurately assess emissions reductions. OAQPS is presently in the process of producing emissions data for 2000 and 2001. With adjustments for non-creditable reductions (certain emissions resulting from pre-1990 controls), these emissions data could potentially be used by nonattainment areas to measure actual reductions in precursor emissions. Under the 2002 Consolidated Emission Reporting Rule, States are required to provide State-wide emissions inventories to OAQPS. State emissions inventories will then be used to update the NEI, making it an accurate baseline from which States can develop future milestone compliance demonstrations for ozone precursor emissions

OAQPS officials agreed that the updated NEI could serve as a source of data for measuring ozone precursor emission reductions by individual nonattainment areas. However, they were hesitant about using the data for milestone compliance demonstrations, noting that State and local agencies may not accept NEI data since it is a top-down database (EPA runs the models and chooses data). The Act provides for a bottom-up approach, whereby States develop and submit to EPA demonstrations that required reductions have been achieved. However, since EPA

[13]See Chapter 2 for discussion of State adjustments to NEI.

adjusts the NEI data every 3 years for State and local periodic inventories, States may have fewer objections. Our contacts with EPA staff in five regional offices indicated that most were willing to consider use of the updated NEI data for milestone demonstrations. Also, some States had already accepted certain NEI data for use in their nonattainment area PEIs, and indicated they would be willing to consider the use of the updated NEI data for milestone compliance demonstrations.

## Meteorologically Adjusted Ozone Data May Also Be Useful

In the mid-1990s, EPA developed a statistical trend model to normalize the effects of meteorological conditions on observed ozone levels. This model produces meteorologically adjusted ozone values that take into account meteorological conditions and thus more accurately reflects the impact of emission reductions on ozone levels over time. OAQPS uses meteorologically adjusted ozone data in national and regional air quality trend reports, but our research indicates that EPA regions and States do not generally use meteorologically adjusted data to assess ozone precursor emissions reductions or evaluate the effectiveness of their controls for individual nonattainment areas. Staff in five EPA regions and two States were aware of EPA's meteorologically adjusted ozone methodology, but most had not used it to perform long-term ozone trend analyses for individual nonattainment areas.

## PAMS Data Could Provide Good Measure of Emission Control Effectiveness

The 1990 Act required EPA, in partnership with State and local agencies, to carry out more extensive, enhanced monitoring of ozone levels and ozone precursor emissions. In response, EPA established the Photochemical Assessment Monitoring Station (PAMS) to collect detailed data on ambient concentrations of VOCs, NOx, and ozone, primarily within urban ozone nonattainment areas. States began implementing PAMS networks around 1994, and began collecting reliable data in 1995 or 1996. States operate the PAMS networks and upload the data into EPA's Air Quality System. Currently, there are about 8 to 9 years of PAMS data for most serious to extreme nonattainment areas in the Air Quality System.

Interviews of air program officials at five EPA regions and two States disclosed that States had developed PAMS data analysis plans and done some analyses of annual and seasonal observations of ambient VOC and NOx concentrations. However, we found little long-term trend analyses of PAMS data. OAQPS staff indicated that the PAMS network produced reliable data on ambient VOC and NOx concentrations, and OAQPS had extracted this data from the Air Quality System into a separate database for trends analysis. However, only limited analytical work regarding individual nonattainment areas had been performed thus

far. In the 2003 National Air Quality and Emission Trends Report, OAQPS provided an analysis of ambient VOC and NOx trends on a national basis, as well as a limited trends analysis of PAMS data for the Atlanta and Chicago nonattainment areas. OAQPS officials indicated that the staff assigned to this project were subsequently reassigned without replacement and no additional analyses of the PAMS data have occurred.

A January 2004 National Research Council report[14] also suggests that EPA and States thus far have made little use of PAMS data to develop long-term trends in ambient concentrations of VOCs and NOx within urban nonattainment areas. The report states:

> *The chief objective of PAMS data collection is to provide an air quality database that will assist air pollution control agencies to assess and refine $O_3$ [ozone] control strategies and specifically evaluate the trends in and effectiveness of controls implemented on VOC and NOx emissions in an area.... In principle, the data from the PAMS network could be extremely useful for the regulatory and scientific communities. However, it appears that the full potential of the data has yet to be realized.*

Since PAMS collects data on the ambient concentrations of precursor emissions, long-term trend analyses of these data could provide a measure of whether ambient concentrations of these compounds for each nonattainment area are increasing or declining. Such trend analyses could be further used as a measure of the success of Federal, regional transport, and local controls in reducing precursor emissions and identifying areas where additional controls or other improvements are needed.

## Conclusions

As EPA develops new ozone control strategies and guidance for the 8-hour standard, the Agency has the opportunity to make better use of available data and methods to measure emission reductions, assess the effectiveness of emission controls in reducing precursor emissions, and evaluate the impact of emission reductions on ozone levels. These tools are especially warranted for nonattainment areas still struggling to achieve the 1-hour ozone standard. More effective use of these tools and methods may identify areas where (1) declines in ozone levels are due to temporary meteorological factors rather than emission reductions, (2) required emission reductions have not been achieved, and (3) precursor emission reductions have not resulted in reduced ozone levels. This information could allow EPA and States to identify shortcomings with

[14] *Air Quality Management in the United States*, National Research Council of the National Academies, January 2004.

current control strategies, develop and implement contingency plans when necessary, and better protect public health.

## Recommendations

We recommend that the Assistant Administrator for Air and Radiation:

6-1 Develop analytical procedures and processes for EPA and/or States to utilize updated NEI data for measuring the progress of individual 8-hour nonattainment areas in reducing precursor emissions and complying with the Act's emission reduction mandates.

6-2 Issue guidance for the development of meteorologically adjusted ozone trends for individual nonattainment areas, updated annually, to better isolate the impact of emission reductions on ozone levels.

6-3 Provide resources to develop PAMS data analyses and identify trends in ambient VOC and NOx concentrations for individual ozone nonattainment areas. Such trends could be used to assess the effectiveness of Federal, regional, and local emission controls and identify where additional controls may be warranted.

## Agency Comments and OIG Evaluation

The Agency generally agreed with the expanded use of the data and analyses presented in this chapter. The Agency indicated that some improvements to the approaches and techniques involved would be needed before they could be used to evaluate the progress of individual nonattainment areas in reducing precursor emissions and related ozone levels. However, as previously stated in Chapter 2, EPA has already used these techniques and approaches, in a limited manner, to evaluate ozone levels and the impact of emission controls on ambient emission and ozone levels for certain nonattainment areas.

The Agency's specific responses to each recommendation presented in this chapter and a detailed OIG evaluation are included in Appendix H.

# Chapter 7
## Specific Performance Goals and Measures Not Developed

EPA and States have not developed specific, quantifiable emission reduction goals and measures for ozone nonattainment areas, although the Act requires these areas reduce emissions by specific amounts within mandated timeframes. In addition to the Act, the Government Performance and Results Act of 1993 requires Federal agencies to develop goals and performance measures for each major program activity. EPA and State staff indicated that goals and measures for ozone precursor emission reductions had not been developed because EPA had not promulgated guidance and methods for measuring these reductions (see Chapter 5). Without goals and measures to provide accountability, there is little incentive for staff to promulgate rules and guidance for measuring emission reductions.

## Statutes Require Goals and Measures

Section 182 of the Act specifies that ozone precursor emissions within nonattainment areas are to be reduced by specific amounts by certain milestone dates. For example, VOC baseline emissions for each nonattainment area should be reduced 15 percent by November 15, 1996. Further, Section 4 of the Government Performance and Results Act provides that each agency shall (1) prepare an annual performance plan covering each program activity; (2) establish performance goals to define the level of performance to be achieved by a program activity; (3) express such goals in an objective, quantifiable, and measurable form; and (4) establish performance indicators to be used in measuring or assessing the relevant outputs, service levels, and outcomes of each program activity.

## EPA Strategic and Annual Plans Included Only Emission Reductions From Federal Rules

EPA Strategic Plans, issued in 2000 and 2003, included goals for NOx and VOC emission reductions related to some national Federal programs and associated rules, such as power plant NOx emissions and mobile source NOx and VOC emissions. However, there were no strategic goals for VOC and/or NOx reductions by ozone nonattainment areas. Further, EPA's Annual Plans for 1999 through 2003 did not include goals and performance measures for emission reductions by individual nonattainment areas. As in the strategic plan, annual plans included goals only for VOC and NOx reductions related to some national Federal programs and associated rules.

## EPA Regional and State Plans Did Not Include Specific Emission Reductions for Nonattainment Areas

EPA Regional annual and multi-year goals and measures are negotiated between regional staff and OAQPS prior to the beginning of each fiscal year. The agreed-to annual goals and measures are subsequently included in Memorandums of Agreement between EPA regions and OAQPS. The agreements for 2000 to 2003 that we reviewed for two EPA regions (Regions 4 and 5) did not contain specific, numeric goals for ozone precursor emission reductions by nonattainment areas. Additionally, our interviews in six EPA regions further indicated that most regional annual plans did not generally have specific goals and measures for ozone precursor emission reductions achieved by individual nonattainment areas. Officials in three regions said EPA had not developed methods and guidance for measuring or demonstrating that emission reductions had been achieved. Most EPA regions indicated that they rely upon air quality, ambient ozone trends, and tracking of State implementation of emission controls to measure overall emission reductions by area.

At least two EPA regions (Regions 1 and 5) indicated that they had developed regional strategic plans, but only one region included a specific strategic goal for nonattainment area emission reductions. Region 1 had established a specific strategic goal of reducing ozone precursor emissions in 8-hour ozone areas by 3 percent annually between 2002 and 2010. However, the region's strategic plan did not show how this goal would be measured.

Interviews with EPA officials in six regions and review of annual or multi-year work plans for three States disclosed that States had not developed goals or measures for emission reductions required by the Act. States listed general goals for reduced emissions, but did not establish specific goals or measures for achieving clean air goals. For example, the New Hampshire Performance Partnership Agreement for 2003 and 2004 included the following general goal without specific measures: "Reduce emissions of criteria pollutants and achieve or maintain mandated air quality standards for the protection of public health and the environment."

Furthermore, States generally had not attempted to measure or demonstrate emission reductions achieved by nonattainment areas. Two States (Georgia and Illinois) submitted one or more milestone compliance demonstrations to EPA but these did not measure or demonstrate actual emission reductions, and EPA regions did not review these demonstrations because EPA had not required that States prepare or submit them. Additionally, one State (Maryland) tried to calculate emission reductions achieved as part of its periodic emission inventory process by comparing the baseline emission inventories to the latest inventory. However, the State had not updated the baseline inventories based on the methods used to

develop the periodic emission inventory and the State did not adjust the baseline inventories for noncreditable emission reductions, as required by the Act.

OAQPS staff acknowledged that EPA regions and States may not have specific nonattainment area goals for ozone precursor emission reductions because EPA has not promulgated rules or guidance on State measurement of emission reductions and the submission of milestone compliance demonstrations that would include such measurements.

## Conclusions

EPA's lack of goals and measures for mandated reductions undermines the legislative intent of the Act in establishing specific emission reduction requirements for ozone precursor emissions. In effect, the absence of goals for emission reductions has resulted in a lack of emphasis in measuring overall reductions in emissions for individual nonattainment areas. EPA needs to expedite the issuance of rules requiring States to demonstrate that required emission reductions have been achieved by nonattainment areas, and promulgate guidance on methods States should use to measure emission reductions. EPA should then establish specific goals and measures for emission reductions by nonattainment areas in EPA and State performance plans. The recent listing of nearly 474 counties that are in nonattainment for the 8-hour standard provides an excellent opportunity for EPA to expedite the issuance of rules requiring States to demonstrate that required emission reductions have been achieved by nonattainment areas, and promulgate guidance on methods States should use to measure emission reductions. EPA should then establish specific goals and measures for emission reductions by nonattainment areas in EPA and State performance plans.

## Recommendations

Once milestone compliance demonstration rules and guidance are issued, we recommend that the Assistant Administrator for Air and Radiation:

7-1 Establish annual and multi-year goals and performance measures for ozone precursor emission reductions by individual nonattainment areas and require State and local agencies to submit evidence that these goals have been met.

7-2 Once annual goals and measures are established, include the goals and measures in EPA, State, and local agencies' annual and strategic plans, and provide accomplishments toward these goals in EPA's annual performance reports.

## Agency Comments and OIG Evaluation

In response to Recommendations 7-1 and 7-2, the Agency indicated that its strategic planning activities were already sufficient to address these recommendations. For example, in response to Recommendation 7-1, the Agency referred to a strategic 2010 goal for people living in areas with unhealthy ozone. While we appreciate this larger goal for ambient ozone, our recommendation pertains to establishing performance measures for precursor emission reductions (NOx and VOCs) by individual nonattainment areas. As noted in our report, ambient ozone is our most complex, difficult to control, and pervasive urban air pollutant. In recognition, the 1990 Act mandated ever increasing levels of precursor emissions reductions until attainment is achieved. Thus, we continue to believe that Recommendation 7-1 is appropriate and necessary to assuring timely ozone attainment. For Recommendation 7-2, EPA indicated that the Agency's strategic goals, objectives, and performance measures reflect the broader goal of protecting public health and, thereby, the measurement of areas and populations with clean air for criteria pollutants. While we appreciate these larger goals, we believe the Agency strategic and annual plans should also include goals for reducing ozone precursor emissions in accordance with the 1990 Act. EPA's current strategic and annual plans already include goals for NOx emission reductions from power plants, as well as VOC and NOx emission reductions from stationary and mobile sources based on Federal rules.

The Agency's specific responses to each recommendation presented in this chapter and a detailed OIG evaluation are included in Appendix H.

# Chapter 8
## Quality Assurance Reviews and Plans Need Improvement

Most EPA regions contacted did not receive and/or review nonattainment area periodic emissions inventories developed by States to ensure that these inventories were properly developed using acceptable models, methods, and emission factors. This was because regions did not consider these emissions inventories to be significant regulatory documents that required review and approval. Generally, States only submitted summary inventory data to OAQPS for updating the ozone precursors in EPA's NEI database. Consequently, EPA did not routinely perform quality assurance reviews for PEI development. Additionally, OAQPS did not have an approved Quality Assurance Project Plan (QAPP) for NEI data to ensure data quality and consistency in accordance with EPA guidance. States we reviewed did not have approved QAPPs for emission inventory and ozone monitoring data that complied with EPA requirements for data quality.

## Act Requires PEIs, EPA Policy Requires QAPPs and Data Quality Objectives

The Act requires that nonattainment areas update their baseline emission inventories every 3 years; these updates are referred to as periodic emissions inventories, or PEIs. States use PEIs for planning, assessing progress in emission reductions, and modeling for attainment of standards. EPA uses PEIs to update or adjust the NEI, which is used, in turn, for air dispersion modeling, strategy development, regulation setting, tracking emission trends, performance measurement, and releasing reports to the public.

Because of the importance of environmental data in decision-making, EPA issued an Agency order[15] nearly 20 years ago requiring that data be of known and acceptable quality in order to be useful. A primary way that EPA ensures that environmental data is acceptable is through the use of approved QAPPs. EPA's quality assurance requirements state that work funded by EPA that involves the acquisition of environmental data generated from direct measurement activities, collected from other sources, or compiled from computerized databases and information systems shall be implemented in accordance with an approved QAPP. Except when specifically stated, all QAPPs prepared by non-EPA organizations must be approved by EPA prior to any data gathering or use, except under special circumstances when immediate action is necessary. The order defines environmental data as information collected directly from measurements, and

[15]EPA Order 5360.1A2, revised May 5, 2000; initial Order 5360.1 issued 1984.

includes environmental data collected by EPA and all EPA-funded organizations (such as States).

EPA's QAPP guidance also requires that QAPPs contain Data Quality Objectives (DQOs) and performance criteria for the environmental data being collected. *EPA's Guidance for the Data Quality Objectives Process* (EPA QA/G-4), dated August 2000, defines DQOs as "qualitative and quantitative statements... that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions."

## EPA Regions Did Not Receive and/or Review PEIs

Only three of seven regions (Regions 1, 4, and 6) required States to submit PEIs, according to officials in the seven EPA regions we contacted, and one of the three did not require PEIs from all of its States. Two regions (Regions 1 and 4) indicated they reviewed PEIs, but none of the seven had formally approved any PEIs. Only one region we interviewed (Region 1) had provided comments to a State regarding PEI quality. The remaining four regions (Regions 2, 3, 5, and 9) generally indicated that State submission of PEIs to regional offices was not a SIP requirement for these States. Table 8.1 summarizes the responses we received from 7 regions for 13 nonattainment areas.

Officials in four EPA regions told us that they did not require PEI submissions and that, if a PEI was submitted, they did not perform an in-depth review, nor did they approve it, largely because EPA had determined that PEIs were not of "regulatory significance." EPA policy only required that nonattainment area baseline inventories be approved by EPA regions. Four regions referred us to September 1992 and September 1994 EPA policies, but we found that these two policies only excluded PEIs from rulemaking until they became significant regulatory documents. Neither policy exempted PEIs from review and approval by regional offices for quality assurance purposes, and in fact called for regional receipt, review, and approval of PEI summary data. For example, the September 1994 memorandum from OAQPS to regional air program chiefs, "1993 Periodic Emission Inventory Guidance," stated:

> *The review and approval of the 1993 periodic emissions inventory is the responsibility of the Regional office. In accordance with the memorandum of September 29,1992, on "Public Hearing Requirements for 1990 Base-Year Emissions Inventories for Ozone and Carbon Monoxide Nonattainment Areas," rulemaking on the 1993 periodic emission inventory can be deferred until it has regulatory significance. In any case, a submittal of a 1993 periodic emission inventory is required to avoid a "finding of Failure to Submit."*

We found no current EPA guidance requiring in-depth regional reviews of the methodologies and factors that States used to develop PEIs. An atmospheric modeling expert indicated that he had encountered significant problems in State emission inventories used for ozone attainment modeling. He said he had found incorrect methodologies were used in identifying emission points and developing and maintaining State emission inventories. He further indicated that EPA needed to perform better quality assurance reviews of State emission inventories.

## OAQPS Did Not Receive Complete Data from States

As shown in Table 8.1 below, many regional offices did not receive State PEIs for nonattainment areas, and the States that submitted electronic files to OAQPS only submitted summary data on the ozone precursor emissions in the nonattainment area. OAQPS used this summary information to develop the NEI for milestone years (1993, 1996, and 1999). Although OAQPS had quality assurance procedures regarding content and formatting of the PEI data received from States, it did not receive information on the models, emission factors, and other methods used by the States to develop the summary inventory data. Without quality control information regarding the development and collection of PEI data, OAQPS cannot assure the accuracy or quality of State PEIs, or subsequent NEIs. For the seven EPA regions we reviewed, Table 8.1 shows their review of PEI's.

**Table 8.1: Regional Receipt and Review of Nonattainment Area PEI's**

| Region | State | Nonattainment Area | Required PEI Submittal | Reviewed | Comments to State | Approval |
|---|---|---|---|---|---|---|
| 1 | MA-NH | Boston-Lawrence-Worcester | yes | yes | yes | no |
| 1 | NH | Portsmouth-Dover-Rochester | yes | yes | yes | no |
| 1 | RI | Providence | no[a] | no | no | no |
| 1 | MA | Springfield | yes | yes | yes | no |
| 2 | NY-NJ | New York-New Jersey-Long Is. | no[b] | no | no[b] | no |
| 3 | MD | Baltimore | no | no | no | no |
| 3 | MD-DC-VA | Washington, DC | no | no | no | no |
| 4 | GA | Atlanta | yes | yes[c] | no | no |
| 5 | IL-IN | Chicago-Gary-Lake County | no | no | no | no |
| 5 | WI | Milwaukee-Racine | no | no | no | no |
| 6 | TX | Dallas | yes | no | no | no |
| 9 | CA | Sacramento Metro | no | no | no | no |
| 9 | CA | San Joaquin Valley | no | no | no | no |

a Providence did not publish or document PEIs for 1996 and 1999; PEI data submitted directly to OAQPS.
b Region 2 only received and reviewed the 1996 PEI for New Jersey; no PEIs received from New York.
c Region 4 informally reviewed Atlanta PEIs but provided no comments to the State.

## States Generally Did Not Have Approved QAPPs

Only one (Region 6) of the five EPA regions we contacted had an approved QAPP for State emissions data (Texas), but it did not contain DQOs to ensure the consistency and accuracy of the State data. Only two of the regions (Regions 5 and 6) had State QAPPs for air monitoring data, including ozone data. QAPPs for State air monitoring data provided by Region 5 had not been approved by the region or the States and both Region 5 and 6 QAPPS did not contain DQOs. The EPA-approved Texas QAPP for air monitoring data[16] stated the following in Section A7, Data Quality Objectives (DQO) for Measurement Data:

> *The tolerable limits on the probability of making a decision error with respect to attainment or nonattainment of the NAAQS (National Ambient Air Quality Standards) for individual criteria pollutants in specified areas is not addressed in the federal regulations and is not attempted in this plan. This results in a break in the DQO process between the decision to be made and the quality of the data needed to make the decision within a defined error tolerance. Because of this, the measurement quality objectives for this project in terms of data accuracy, precision, and completeness are based on available monitoring technology and many years of practical monitoring experience rather than the DQO process.*

Three regions (Regions 1, 3, and 4) could not provide any QAPPs for ozone air monitoring data. Some regions believed State Quality Management Plans would suffice in lieu of QAPPs, but such plans are broad, covering all of a State's environmental programs, and do not include accuracy and precision criteria or DQOs. One region stated that since EPA had not promulgated the DQOs for ozone air monitoring data, the region had not required QAPPs. Another region indicated that its States still used EPA-approved quality assurance plans from the mid-1980s, before QAPPs were required, and is in the process of negotiating current State QAPPs for air monitoring data, including ozone.

## NEI Did Not Have An Approved QAPP

OAQPS staff stated that until a few years ago they did not believe a QAPP was necessary for NEI ozone precursor emissions data because a significant amount of these data came from other sources, such as States and power plants. OAQPS does, however, maintain its own internal QAPP for data it collects or develops from modeling. In July 2003, OAQPS provided the OIG with a copy of a draft, unapproved QAPP for NEI data. It did not contain DQOs, as required by EPA's guidance, and quality assurance staff at OAQPS indicated that DQOs for emission

[16] Texas Commission on Environmental Quality, NAMS/SLAMS Network and U.S./Border Support Activities Quality Assurance Project Plan for 2002 and 2003.

data produced by States or EPA have not yet been developed. The draft still had not been finalized as of May 2004.

## DQOs for Emission and Ozone Data Not Promulgated

OAQPS staff referred us to NEI planning and preparation documents for DQO-type guidance related to NEI data. However, these documents primarily establish how OAQPS will obtain and assimilate emissions data from external sources and perform quality assurance on data input. The documents did not contain specific precision and acceptance criteria for emissions data collected or developed by OAQPS through modeling or other methodologies. An OAQPS official indicated that DQOs for ozone data, which have to be issued as a regulation, have been developed but the DQOs have not been released.

An OAQPS official indicated that States should have QAPPs for ozone and other air monitoring data based on the pre-1990 precision and acceptance criteria, even though the DQOs have not been issued. However, the pre-1990 requirement for precision for ozone data was plus or minus 15 to 20 percent, whereas the ozone DQO will require a more strict precision level of plus or minus 7 percent**.**

## Conclusions

States use nonattainment area PEIs for many critical activities, such as planning and modeling for SIP revisions and attainment demonstrations. EPA also uses State emissions inventories to adjust the NEI and the NEI data are used in regulatory planning and public information releases. Therefore, adequate quality assurance of these data is critical. Despite the important role of State emissions data, EPA has no consistent process for ensuring the quality of the State PEIs. EPA regions did not require, receive, and/or review PEIs. Additionally, OAQPS did not receive sufficient information regarding State inventory development and methodologies to provide quality assurance for inventories used to update and adjust the NEI. Further, QAPPs for ozone air monitoring data need improvement. Some States did not have QAPPs for air monitoring data; others had air monitoring QAPPs that did not include required DQOs. EPA has not developed DQOs for ozone precursor emissions data, and the ozone DQOs it has developed have not been released.

## Recommendations

We recommend that the Assistant Administrator for Air and Radiation:

8-1 Develop DQOs, using EPA DQO development guidance, for State- and NEI-generated emissions data for use in applicable QAPPs.

8-2 Expedite completion and approval of the draft QAPP for NEI data.

8-3 To the extent possible, expedite the regulatory process for releasing ozone DQOs for use in State air monitoring QAPPs.

8-4 Inform EPA regions that approved State QAPPs are needed for emissions and ozone air monitoring data accumulated or developed by States within each region's boundaries.

8-5 Promulgate policies and procedures which require regions to obtain State PEIs and review the PEIs for quality and compliance with EPA emission inventory development guidance.

## Agency Comments and OIG Evaluation

The Agency generally agreed with the recommendations presented in this chapter. The Agency's specific responses to each recommendation presented in this chapter and a detailed OIG evaluation are included in Appendix H.

**Appendix A**

# *Details on Scope and Methodology*

To assess whether emission reduction controls have been as effective as originally projected in reducing ozone precursor emissions, we interviewed air program officials at EPA's OAQPS, five EPA regions, and the States of Georgia and Wisconsin. Further, we reviewed Agency guidance regarding planning, implementation, and oversight of programs to reduce ozone precursor emissions (NOx and VOC) and the following pertinent documentation:

- EPA Annual Performance Reports for 2000 through 2003.
- SIPs for Georgia and Wisconsin, including revisions for ozone attainment demonstrations.
- Emission control assessments, evaluations, and compliance reports for Georgia and Wisconsin.
- SIP revisions involving ROP Plans for 10 nonattainment areas.
- Emission control development and implementation for ROP Plans for 10 nonattainment areas.
- OAQPS emissions trend analyses for 25 serious to extreme nonattainment areas.

To assess whether EPA and States adequately measured the effectiveness of emission controls in reducing overall precursor emissions as required by the Act, we interviewed air program officials at OAQPS, five EPA regions, and the States of Georgia and Wisconsin. We also interviewed external atmospheric scientists/engineers and modeling experts; reviewed Clean Air Act requirements in Section 182 and Government Performance and Results Act requirements in Sections 3 and 4; and researched other documentation related to:

- Projected and actual measurements of emissions by five EPA regions and two States for 10 ozone nonattainment areas.
- PAMS data analyses by States and EPA for ambient concentrations of VOCs and NOx within nonattainment areas.
- EPA Air Quality System and external data on ozone exceedance days, observed ozone levels, and ozone trends between 1990 and 2003.
- EPA Strategic Plans for 2000 and 2003.
- EPA Annual Plans for 1999 through 2004.
- Regional Memorandums of Agreement and/or Strategic Plans for EPA Regions 3, 4, and 5.
- Section 105 air program work plans for Georgia and Wisconsin.

To assess whether emission reduction plans and related controls had been properly completed and implemented to reduce precursor emissions by 3 percent annually within the 1990 Act's time frames, we interviewed officials at OAQPS, six EPA regions, and two States; downloaded and analyzed emission data from NEI for 25 serious to extreme nonattainment areas; and reviewed documentation related to:

- ROP Plans for 10 ozone nonattainment areas in five EPA regions.
- SIP attainment demonstrations for Georgia and Wisconsin.
- Baseline and periodic emission inventories for 10 nonattainment areas.
- Emission control evaluations and compliance reports for Georgia and Wisconsin.

To gain an understanding of EPA, State, and local agency responsibilities in planning for and reducing ozone precursor emissions, we reviewed regulations, guidance, and policies involving the development and implementation of SIPs, ROP Plans, emission control measures, baseline emission inventories, periodic emission inventories, and quality assurance for air monitoring and emission inventory data. We also obtained budget and staffing information for EPA's ozone program for fiscal years 2000 through 2003 from OAQPS and the Office of the Chief Financial Officer.

To identify statutory requirements for EPA and States to classify ozone nonattainment areas; promulgate SIPs, ROP Plans, and emission controls; and reduce ozone precursor emissions, we reviewed Sections 110, 171-172, and 181-183 of the Clean Air Act.

Our scope was limited to OAQPS, five EPA Regions (1, 3, 4, 5, and 6), and 10 serious to severe ozone nonattainment areas within these regions, with the following exceptions: certain information was obtained from Regions 2 and 9 related to three other nonattainment areas, analyses of NEI data involved 12 serious or severe ozone nonattainment areas, and air quality data and related studies for the total 25 serious to extreme nonattainment areas were obtained and reviewed. Details on the 12 serious to severe ozone nonattainment areas (which includes the aforementioned 10) are in Table A.1.

**Table A.1: 12 Nonattainment Areas Reviewed**

| Nonattainment Area | EPA Region | State(s) | Current 1-Hour Classification | Total Counties | Population 2000 (thousands) |
|---|---|---|---|---|---|
| Atlanta | 4 | GA | Severe[a] | 13 | 3,699 |
| Baltimore | 3 | MD | Severe | 6 | 2,512 |
| Boston-Lawrence-Worcester | 1 | MA-NH | Serious | 12 | 5,883 |
| Chicago-Gary-Lake County | 5 | IL-IN | Severe | 10 | 8,758 |
| Dallas-Fort Worth | 6 | TX | Serious | 4 | 4,590 |
| Milwaukee-Racine | 5 | WI | Severe | 6 | 1,839 |
| Portsmouth-Dover-Rochester | 1 | NH | Serious | 2 | 192 |
| Providence | 1 | RI | Serious | 5 | 1,048 |
| Sacramento Metro | 9 | CA | Severe | 6 | 1,978 |
| San Joaquin Valley | 9 | CA | Extreme[b] | 8 | 3,191 |
| Springfield | 5 | MA | Serious | 4 | 815 |
| Washington DC | 3 | DC-MD-VA | Severe[a] | 16 | 4,545 |

[a] Areas reclassified from serious to severe nonattainment during 2003.
[b] Area reclassified from severe to extreme nonattainment in April 2004.

## Prior Related Coverage

### *Government Accountability Office (formerly General Accounting Office)*

- *Air Pollution: EPA Could Take Additional Steps to Help Maximize the Benefits from the 2007 Diesel Emissions Standards*, GAO-04-313, March 11, 2004
- *Clean Air Act: Key Stakeholders' Views on Revisions to the New Source Review Program*, GAO-04-274, February 2, 2004
- *Clean Air Act: New Source Review Revisions Could Affect Utility Enforcement Cases and Public Access to Emissions Data*, GAO-04-58, October 21, 2003
- *Clean Air Act: EPA Should Use Available Data to Monitor the Effects of Its Revisions to the New Source Review Program*, GAO-03-947, August 22, 2003
- *Environmental Protection: Federal Planning Requirements for Transportation and Air Quality Protection Could Potentially Be More Efficient and Better Linked*, GAO-03-581, April 28, 2003
- *Emissions from Older Electricity Generating Units*, GAO-02-79, June 2002
- *Meeting Electricity Demands Will Increase Emissions of Some Harmful Substances*, GAO-03-49, October 2002
- *Environmental Protection: Wider Use of Advance Technologies Can Improve Emissions Monitoring*, GAO-01-313, June 2001
- *Emission Sources Regulated by Multiple Clean Air Act Provisions*, GAO/RCED-00-155, May 2000
- *Status of Implementation and Issues of the Clean Air Act Amendments of 1990*, GAO/RCED-00-72, April 2000
- *The Border Smog Reduction Act's Impact on Ozone Levels*, GAO/RCED-99-212, July 1999
- *Delays In Motor Vehicle Inspection Program Jeopardize Attainment of Ozone Standard*, GAO/RCED-98-175, June 1998
- *Air Pollution - Limitations of EPA's Motor Vehicle Emissions Model and Plans to Address Them*, GAO/RCED-97-210, September 1997

### EPA OIG

- *Consistency and Transparency in Determination of EPA's Anticipated Ozone Designations*, Report No. 2002-S-00016, August 15, 2002
- *Clean Air Design Evaluation Results*, Report No. 2002-M-000013, April 23, 2002
- *EPA and State Progress In Issuing Title V Permits*, Report No. 2002-P-00008, March 29, 2002

- *Consolidated Report on OECA's Oversight of Regional and State Air Enforcement Programs*, Report No. E1GAE7-03-0045-8100244, September 25, 1998

- *Consolidated Review of the Air Enforcement and Compliance Assistance Programs*, Report No. E1GAE5-05-0169-7100306, September 30, 1997

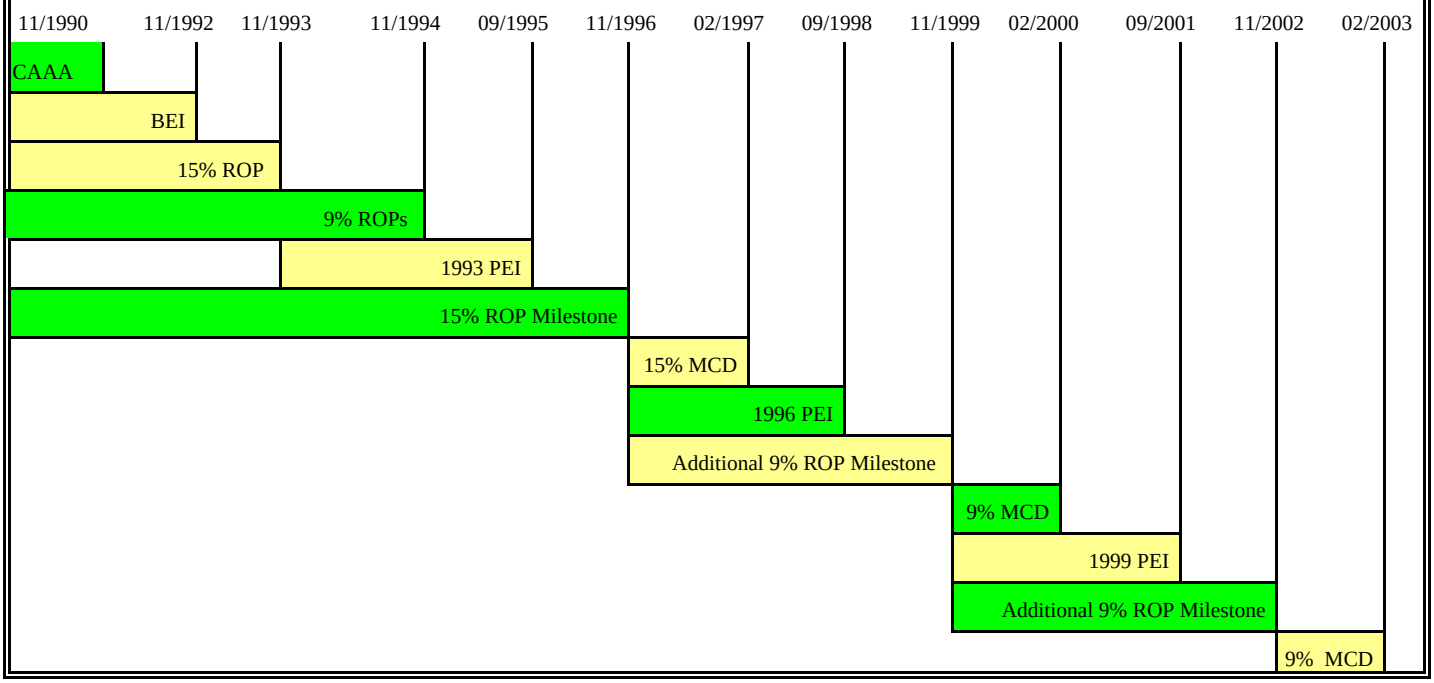
- *EPA's Air State Implementation Plan Program Consolidated Report*, Report No. E1KAE6-05-0044-6400100, September 30, 1996

- *Emission Factor Development*, Report No. E1KAF6-24-0008-6100318, September 30, 1996

**Appendix B**

# *Timeline of Clean Air Act Requirements*

**Illustration B.1:**
**Clean Air Act Timeline for ROP and Emission Inventory Submittals and Emission Reduction Milestones Through 2003**




CAAA = Clean Air Act Amendments
BEI = Baseline Emissions Inventory
MCD = Milestone Compliance Demonstration
Milestone = Date percent emissions reduction should be achieved.
PEI = Periodic Emissions Inventory
ROP = Rate of Progress Plan

**Appendix C**

# *Details on EPA Analyses of Meteorologically Adjusted Ozone Observations*

In 2003, OAQPS developed and analyzed 1990 through 2002 meteorologically adjusted ambient 8-hour ozone observations for 53 metropolitan areas, which included 19 serious, severe, and extreme ozone nonattainment areas. OAQPS used a method developed by OAQPS experts[17] to statistically adjust raw ambient ozone observations to exclude the effects of variations in weather patterns on ambient ozone levels.

As noted in Chapter 2, our analysis of the meteorologically adjusted ozone levels and charts developed by OAQPS for the 19 nonattainment areas indicated that, once weather had been excluded as a factor in ozone formation, 12 areas had achieved little or no improvements in ozone levels over the 13-year period.

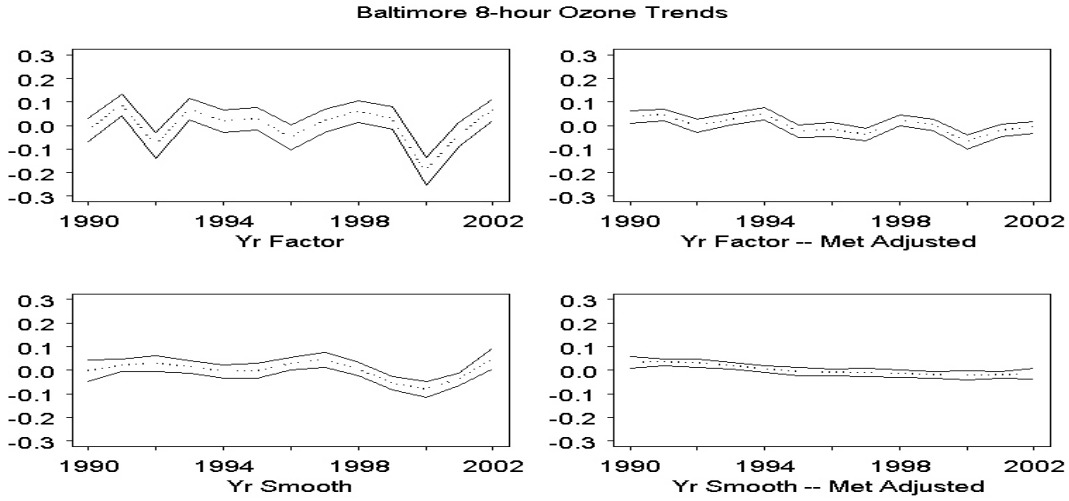
This OAQPS study included only a summary of the methodology used and charts for each of the 53 metropolitan areas showing meteorologically adjusted trends in ozone from 1990 through 2002. There was no written analysis for each of the 53 areas. OAQPS's general summary of the analysis stated, in part, the following:

> *Generally, annual variations in unadjusted ozone are quite large compared with annual ozone variations after adjustment [for weather conditions]. For [example] Baltimore, most of the apparent upturn in ozone between 2000 and 2002 is related to more favorable meteorological conditions in 2000 and 2001 compared with 2002.*

Charts produced by OAQPS staff for the Baltimore nonattainment area follow. The raw ambient ozone observations show a significant drop in ozone levels for the 2000-2001 period. However, the meteorologically adjusted chart does not indicate a significant decrease in ozone for the same period, indicating that the drop in ozone levels was weather related.

[17] "Assessment of Interannual Ozone Variation in Urban Areas From A Climatological Perspective," Atmospheric Environment, Volume 30, No. 14, pp 2615-2625, 1996, William Cox and Shao-Hang Chu, EPA.

**Illustration C.1:**



**Appendix D**

# *Details on State Delays in Submitting ROP Plans*

## Submission and Approval of 15-Percent ROP Plans

The 10 serious and severe nonattainment areas in our review involved 14 ROP Plans that required a 15-percent reduction in VOCs (net of growth) by November 15, 1996. Of these 14 ROP Plans, 5 were submitted to EPA by the required date of November 15, 1993, and 9 were submitted approximately 2 months to almost 2 years late. Only 1 of the 14 plans received EPA final approval prior to the milestone date of November 15, 1996. For the other 13 ROP Plans, 11 received final approval from 8 months to 6 years after the milestone date, and two have not yet received final approval.

None of the 15-percent ROP Plans were approved or disapproved within 18 months of submission. Elapsed time between initial State submission and EPA final approval ranged from 2 to 11 or more years. Nine plans received conditional approvals, but only 1 was approved or disapproved within 1 year after the conditional approval, as required by the Act. Two ROP Plans received both "interim" and "final" conditional approvals, but such "conditional" approvals are not mentioned in the Act.

Table D.1 shows the date that States initially submitted the 15-percent ROP Plans to EPA and the dates that these plans received final EPA approval. The table also shows the number of State revisions required for each and the approximate time taken by States to make these revisions.

**Table D.1: 15-Percent ROP Plans**

| Nonattainment Area | 15% ROP Submittal Due Per CAA | Originally Submitted by State | No. of Rev. | Interval Between Revisions | Conditional Approvals | Final Approval | Elapsed Time Submittal to Final | Final Approval After Milestone 11/15/1996 |
|---|---|---|---|---|---|---|---|---|
| Atlanta | 11/15/93 | 11/15/93 | 2 | 1-3 years | 09/12/97<br>04/26/99 | None[a] | 11+ years | 7+ years |
| Baltimore | 11/15/93 | 07/12/95 | 2 | 1-2 years | 10/09/97[b]<br>10/07/98 | 02/03/00 | 4.5 years | 4 years |
| Boston-Lawrence-Worcester<br>-Massachusetts<br>-New Hampshire | 11/15/93 | <br>11/15/93[c]<br>02/03/94 | <br>5<br>2 | <br>1-5 years[d]<br>1-2 years | <br>07/14/97<br>NA | <br>08/28/02<br>12/07/98 | <br>8.75 years<br>5 years | <br>6 years<br>2 years |
| Chicago-Gary-Lake County<br>-Illinois<br>-Indiana | 11/15/93 | <br>11/15/93<br>01/13/94 | <br>6<br>2 | <br>1-1.5 years<br>1.5- years | <br>NA<br>NA | <br>12/18/97<br>07/18/97 | <br>5 years<br>3.5 years | <br>1 year<br>8 months |
| Dallas-Fort Worth | 11/15/93 | 05/09/94 | 4 | 1-3 years | 11/10/98 | None[e] | 4.3 years | 7+ years |
| Washington, DC Area<br>-Maryland<br>-District of Columbia<br>-Virginia | 11/15/93 | <br>07/12/95<br>05/15/95<br>05/15/95 | <br>2<br>2<br>2 | <br>2-3 years<br>1 year<br>1-2 years | <br>09/23/97<br>07/07/98<br>06/24/97 | <br>07/19/00<br>08/05/99<br>10/06/00 | <br>5 years<br>4.25 years<br>5.5 years | <br>4 years<br>3 years<br>4 years |
| Milwaukee-Racine | 11/15/93 | 11/15/93 | 1 | 1-2 years | NA | 03/26/96 | 2.75 years | None |
| Portsmouth-Dover-Rochester | 11/15/93 | 02/03/94 | 2 | 1-2 years | NA | 12/07/98 | 4.75 years | 2 years |
| Providence[g] | 11/15/93 | 03/15/94 | 1 | 4 years | 04/17/97[f] | 12/08/98 | 4.75 years | 2 years |
| Springfield | 11/15/93 | 11/15/93 | 6 | 1-3 years | NA | 08/28/02 | 8.75 years | 6 years |

[a] Region 4 issued a "final conditional interim approval" for Atlanta 15-percent ROP Plan on April 26, 1999 in 64 FR 20186. Region 4 did not issue a "final" approval after conditions were met for 15-percent ROP Plan.

[b] 07/12/95 submittal did not include sufficient emission reductions to meet 15-percent requirement and account for growth for 1990-1996 period. Also, I&M program only conditionally approved. Federal Register Volume 65, page 6246, dated 02/03/2000, listed four problems that Baltimore must rectify, as stated in 10/09/97 conditional approval.

[c] EPA ruled that the 11/15/93 ROP Plan was incomplete.

[d] Processing of ROP Plan was suspended in 1999 due to air quality meeting 1-hour standard for period 1996-1998. However, area subsequently violated standard again for period 1999-2001. ROP Plan processing initiated again in 2002.

[e] EPA proposed approval of 15-percent and post-1996 9% ROP Plans on 01/18/2001; however, final approval has not been issued.

[f] The 04/17/97 rule was a limited approval/limited disapproval rather than a conditional approval. See 62 Federal Register 18712, 04/17/97.

[g] Rhode Island Department of Environmental Management stated that the State did not publish 1996 and 1999 periodic inventories. The emissions data in the State systems at the time was electronically submitted to Air Quality System/NEI but no documentation was retained.

Delayed approval of 15-percent ROP Plans can be attributed to many factors, including the number of revisions made by States, the extensive time taken by States to revise the plans, and the time taken by EPA to review and approve the plans once received. As can be seen in the Table D-1, 15-percent ROP Plans were revised or modified as many as six times prior to final approval. States took from less than 1 year to as many as 5 years to submit revisions to the plans. Another problem stemming from major statutory and EPA policy guidance changes in the mid-1990s is that States were allowed to claim up to 100 percent of projected emission reductions for decentralized I&M programs. Prior to these changes, EPA had allowed States credit for only 50 percent of projected emission reductions from decentralized I&M systems. State revisions to their programs based on the new guidance delayed conditional and/or final approval of 15-percent ROP Plans. At least one region indicated that it did not pressure a particular State

with a centralized I&M program to submit its revised ROP Plan because the other States with decentralized programs were still in the process of revising their ROP Plans based on the new guidance. Also, many States failed to implement their I&M programs, further delaying ROP Plan approval.

According to ambient ozone monitoring data, 4 of 10 nonattainment areas met the 1-hour standard in 1998 through 2000, but the areas subsequently violated the standard again. Processing of all ROP Plans, including the 15-percent and 9-percent plans that had not been approved by 1998 and 1999, was suspended once the areas attained the standard, but ROP Plan development was reinitiated once an area again violated the standard. Suspension of ROP Plan processing contributed to significant delays in finalizing the 15-percent and 9-percent ROP Plans for these four areas. Suspension of ROP development for these areas is discussed in more detail below.

## Submission and Approval of 9-Percent ROP Plans

The 14 post-1996 (9-percent) ROP Plans reviewed required that each nonattainment area achieve a 9-percent reduction, net of growth, in either VOC and/or NOx emissions by November 15, 1999. These ROP Plans were to be submitted to EPA by November 15, 1994. Only three were submitted on time, and only one received final EPA approval prior to November 15, 1999. Two post-1996 ROP Plan have not yet received final approval from EPA and the remaining 12 were not granted final approval until 2 months to 3.5 years after the deadline. EPA issued a policy memorandum in March 1995, *Ozone Attainment Demonstrations*, that extended the date to mid-1997 for serious and above nonattainment areas to submit their first post-1996 ROP Plan. EPA issued the memorandum because States were having difficulty in developing timely and acceptable emission inventories, ROP Plans, and attainment demonstrations within the time frames provided in the Act.

Table D.2 shows the submission, number of revisions, and final approval dates of State's post-1996 ROP Plans for 10 serious or severe nonattainment areas.

As with the 15-percent ROP Plans, the 9-percent plans were subject to several revisions and extensive time intervals for revision, review, and approval. None of the 9-percent plans received EPA approval or disapproval within 18 months as required by the Act. The elapsed time between ROP Plan submittal and EPA final approval ranged from 2 to 7 or more years. Only the Washington area post-1996 ROP Plans received conditional approvals.

States also had problems developing the Act's required ozone attainment demonstrations, which delayed final approval for many ROP Plans. In most cases, the post-1996 plans were contingent upon emission reductions from enhanced vehicle I&M programs, and several States were late in implementing the enhanced programs (Georgia, Massachusetts, and Texas).

**Table D.2: Post-1996 (9%) ROP Plans**

| Nonattainment Area | 9% ROP Submittal Due Per CAA | Originally Submitted by State | No. of Rev. | Interval Between Revisions/ Final | Conditional Approvals | Final Approval | Elapsed Time Submittal to Final | Final Approval After Milestone 11/15/1999 |
|---|---|---|---|---|---|---|---|---|
| Atlanta | 11/15/04 | 11/15/03 | 2 | 2-3 years | NA | 03/18/99 | 5.5 years | NA |
| Baltimore | 11/15/94 | 12/24/97<br>04/24/98 | 2 | 1-3 years | NA | 09/26/01 | 3.75 years | 2 years |
| Boston-Lawrence-Worcester<br>-Massachusetts<br>-New Hampshire | 11/15/94 | <br>11/15/94<br>09/27/96 | <br>6<br>1 | <br>5 years<br>6 years | <br>NA<br>NA | <br>08/28/02[d]<br>04/16/02[d] | <br>7.75 years<br>5.5 years | <br>3 years<br>2.5 years |
| Chicago-Gary-Lake County<br>-Illinois<br>-Indiana | 11/15/94 | <br>12/18/97<br>12/17/97 | <br>3<br>1 | <br>>1 year[a]<br>2 mo.-2 years | <br>NA<br>NA | <br>12/18/00<br>01/26/00 | <br>3 years<br>2 years | <br>1 year<br>2 months |
| Dallas-Fort Worth | 11/15/94 | 03/19/99 | 2 | >1-1 year | NA | None[b] | 7+ years | 5+ years |
| Washington, DC Area<br>-Maryland<br>-District of Columbia<br>-Virginia | 11/15/94 | <br>12/24/97<br>11/03/97<br>12/19/97 | <br>1<br>1<br>1 | <br>1-1.5 years | <br>09/28/00<br>10/19/00<br>10/19/00<br>02/03/03[c] | <br>01/03/01<br>04/17/03[c] | <br>3 years<br>3 years<br>3 years | <br>1 year<br>3.5 years[c] |
| Milwaukee-Racine | 11/15/94 | 12/11/97 | 4 | 1 mo.-2 years | NA | 10/10/01 | 4 years | 2 years |
| Portsmouth-Dover-Rochester | 11/15/94 | 09/27/96 | 1 | 6 years | NA | 04/16/02 | 5.5 years | 2.5 years |
| Providence | 11/15/94 | 11/15/94 | 0 | 3 years | NA | 06/08/01 | 3 years | 1.5 years |
| Springfield | 11/15/94 | 11/15/94 | 6 | >1-2 years | NA | 08/28/02 | 7.75 years | 3 years |

[a] Illinois amendments to post-1996 plan were submitted 12/17/99, 01/14/00, and 01/21/00. All amendments were after emission reductions were to be achieved, 11/15/99.

[b] EPA proposed approval of 15-percent and post-1996 9-percent ROP Plans on 01/18/2001; however, final approval has not been issued.

[c] Federal court vacated the post-1996 (1999) ROP Plan approved 01/03/01; however, none of the emission targets, reduction credits, or calculations were changed when ROP Plan was reapproved on 04/17/03. The 02/03/03 conditional approval is contained in Federal Register Vol. 68, page 5246, dated 02/03/03.

[d] Processing of ROP Plan was suspended in 1999 due to air quality meeting 1-hour standard for period 1996-1998. However, area subsequently violated standard again for period 1999-2001. ROP processing initiated again in 2002.

## Impact of Clean Data Policy on ROP Plans

Region 1 had four nonattainment areas that achieved attainment of the 1-hour in 1998 through 2000, based on air monitoring data, but later violated the standard again in 2001 or 2002. The processing of the post-1996 ROP Plans were suspended once the area air monitoring data for the previous 3-years showed attainment of the 1-hour standard. The processing was not reinitiated until the areas again violated the 1-hour standard. As a result, ROP Plan development and approvals for these areas were delayed.

Region 1 indicated that a May 1995 EPA policy,[18] referred to as the "Clean Data Policy," provided that certain SIP requirements could be suspended once air monitoring data indicate attainment, i.e., 3 years with a total of three or less 1-hour exceedances. However, Section 107(d)(1)D, E of the Act indicates that SIP requirements are to remain in effect until an area is officially redesignated as being in attainment based on permanent enforceable emission reductions and an approved a maintenance plan that will ensure continued attainment. However, the 1-hour attainment for these areas was partially due to changes in meteorological conditions, not permanent and enforceable emission reductions.

In these cases, Region 1 suspended processing and implementation of ROP Plans based only on ambient monitoring data that showed that these areas had experienced three or less violations in the prior 3-year period. In addition to ambient ozone monitoring data, new methodologies and data currently exist that allow EPA regions to better assess the permanence of attainment. For example, EPA has PAMS data, collected since the mid-1990s, that permits trend analysis of ambient VOC and NOx concentrations over time. Such a trend analysis of monitoring system data could be used to determine whether ambient precursor concentrations of NOx and VOCs have been sufficiently reduced to assure attainment despite changes in weather. Similarly, before suspending ROP Plan requirements, EPA could determine whether upwind contributing sources have been sufficiently controlled to allow attainment, and require a meteorologically adjusted ozone trend analysis for nonattainment areas that attain based on ambient ozone monitoring data to better assure the permanence of such attainments.

[18] Policy referred to as "Clean Data Policy" was issued on May 10, 1995, in memorandum from OAQPS Director to regional air program directors, titled "Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard."

**Appendix E**

# *Growth Factors Used In Projecting ROP Emissions for Atlanta Area*

For the Atlanta area, which is just one example of an area that did not reflect historical growth rates, substantial differences existed between VOC and NOx target levels and the relevant PEIs. The differences for VOCs and NOx emissions, ranged from 104.11 tons per day in VOCs for the 15-percent ROP Plan to 175.06 tons per day in NOx for the post-1996 ROP Plan. These differences represented 23.4 to 39.8 percent understatements of the respective emission target levels. More importantly, the understatements indicate that required VOC and NOx emission reductions could be deficient as much as 104 and 175 tons per day, respectively. This potential deficit in emission reductions is significant considering that the 15-percent ROP Plan only contained emission control measures projected to reduce VOC emissions by 117 tons per day and the post-1996 ROP Plan contained only 50.10 tons per day in NOx reductions.

Officials with Georgia's Air Protection Division indicated that the State may have used a growth rate as low as 1 to 2 percent in projecting milestone year emissions for the 15-percent and post-1996 ROP Plans. The State officials further indicated that they no longer possessed documentation of the actual growth rates/factors used or how these rates/factors were determined. The officials admitted that the 1- to 2-percent growth factors may have been too low, resulting in the significant differences between target levels and PEI emissions data.

Information obtained from the Atlanta Regional Planning Commission indicated that a growth rate of 1 or 2 percent for the Atlanta metropolitan area would be substantially below the actual population and employment growth rates prior to and after the 15-percent and post-1996 ROP Plan milestone dates. Population growth in the Atlanta metropolitan area for the period 1980 through 1990 averaged about 3 percent per year. From 1990 to 1995 and 1995 to 2000, the population grew at 2.4 and 2.8 percent annual rates, respectively. Atlanta area employment between 1980 through 1990 expanded at a rate of over 4.5 percent with the employment rate declining slightly to between 2.8 and 4 percent between 1990 and 1997 and increasing again to between 3.7 and 4.3 percent between 1997 and 1999. Based on this information, the State's use of a 1- or 2-percent growth rate in projecting 1996 and 1999 precursor emissions is questionable.

The Atlanta Regional Planning Commission also commented on EPA's proposed approval of the Atlanta post-1996 ROP Plan and stated that Georgia was using outdated vehicle miles traveled estimates in the ROP projections and calculations related to Atlanta area emissions. Federal Register Volume 64, page 13340, dated March 18, 1999, stated the following:

> *Comment: The Atlanta Regional Commission (ARC) submitted a letter on September 9, 1998, providing comment on the 9 percent plan. The comment concerned the use of vehicle miles traveled (VMT) estimates. ARC updated the VMT estimates in 1996. The 9 percent plan used the VMT estimates previously provided to the Georgia Environmental Protection Division (GAEPD) by ARC rather than the 1996 updated*

*VMT estimates. ARC recalculated the transportation emissions budget using the updated VMT and requested in the September 9, 1998, letter that this higher emissions budget be used as the applicable transportation conformity budget.*

EPA acknowledged that the vehicle miles traveled estimates used by Georgia were not current but stated that the region would address this problem in the region's action on the Atlanta attainment demonstration, which will occur in a future Federal Register notice.

**Appendix F**

# *Outside NOx Reductions Claimed in Post-1996 Chicago-Gary-Lake County Nonattainment Area ROP*

In the post-1996 ROP Plan for the Illinois portion of the Chicago-Gary-Lake County nonattainment area, Illinois claimed NOx emissions reductions of 40 to 60 percent, or 221.92 tons per day, between 1990 and 1999 at nine power plants outside of the Chicago and East St. Louis nonattainment areas. The State used the 1990 Illinois Attainment Area NOx emissions (NOx emissions outside of Chicago and East St. Louis nonattainment areas) as the ROP baseline for computing required NOx reductions in the post-1996 ROP Plan. The post-1996 ROP Plan was required to include a 9-percent reduction in baseline VOCs or NOx emissions for the Chicago area. These emission reductions from outside the nonattainment area represented almost 7 percent of the total 9 percent in required reductions. The other 2 percent came primarily from projected VOC reductions within the Chicago nonattainment area.

In response to our request for technical support for the Acid Rain NOx reductions claimed in the post-1996 ROP Plan, Region 5 provided NOx reduction percentages for five of the power plants as shown in an EPA 1998 Acid Rain compliance report.[19] Region 5 indicated that they did not possess any information on the NOx reductions for the remaining plants. The Region's response did not mention Hennepin Units 1-2, which were listed in the post-1996 ROP Plan and the 1998 Acid Rain compliance report. The Acid Rain report showed only an 8-percent decrease in NOx emissions for Hennepin Units 1-2 between 1990 and 1998. Also, post-1996 ROP NOx emission reductions were claimed through 1999. In addition, this compliance report only reflects the Acid Rain Phase I reductions through 1998. However, the post-1996 ROP Plan also included reductions from early implementation of Phase II controls. Furthermore, the 1998 compliance report only included 1990 and 1998 NOx emission rates and percent reductions. There was no conversion of these rates to show daily NOx emission reductions for comparison to the State reductions claimed in the post-1996 ROP Plan.

Our analysis of 1990 through 1999 NEI data for the nine power plants indicated that annual NOx reductions were only reduced 12.5 percent between 1990 and 1999. These data do not support the State's claim of 40 to 60 percent in daily NOx reductions. NEI data[20] indicated that one plant actually increased NOx emissions by 74.4 percent, or 16,497 tons per year, between 1990 and 1999, while the State claimed a reduction of 14.3 tons per day for the same period.
A comparison between 1990 and 1999 NOx emissions for these plants, per the NEI, is shown in

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[19] 1998 Compliance Report Acid Rain Program (EPA-430-R-99-010, Office of Air and Radiation, Acid Rain Division), dated July 1999.

[20] NEI NOx data for power plants is generally based on Continuous Emissions Monitor Systems, which is the best emission monitoring technology currently available.

Table F.1. (Note: Baldwin units 1-3 were listed separately in the post-1996 ROP Plan for a total of nine plants. However, the NEI does not separate these units.)

**Table F.1: NEI NOx Data for Illinois Power Plants**

| Power Company - Emission Units | 1990 NOx Emissions (tpy)[a] | 1999 NOx Emissions (tpy) | 1990-1999 Reductions | Percent Reduction |
|---|---|---|---|---|
| Dominion Energy - Kincaid 1-2[b] | 39,477.82 | 27,118.68 | 12,359.14 | 31.3 |
| Electric Energy - Joppa Steam 1-6 | 20,869.82 | 8,446.82 | 12,423 | 59.5 |
| Cilco - Edwards 2-3 | 18,003.38 | 10,193.49 | 7,809.89 | 43.4 |
| Illinois Power - Baldwin 1-3 | 57,159.77 | 55,026.84 | 2,132.93 | 3.7 |
| Commonwealth Edison - Powerton 5-6 | 22,176.91 | 38,674.09 | -16,497.18 * | -74.4[b] |
| Illinois Power - Vermillion 1-2 | 3,367.42 | 1,962.23 | 1,405.19 | 41.7 |
| Illinois Power - Hennepin 1-2 | 4077.39 | 3032.04 | 1045.35 | 25.6 |
| **Totals** | **161,132.51** | **144,454.15** | **20,678.32** | **12.5** |

[a] tpy = tons per year
[b] Negative numbers represent increased NOx emissions.

Assuming constant demand on these units throughout the year, the total 20,678.32 tons per year reduction would equate to only 56.65 tons per day. The State post-1996 ROP Plan claimed a NOx reduction of 221.97 tons per day between 1990 and 1999 for these same power plants. NEI data also indicated:

- only a 0.27 percent decrease in total NOx emissions and a 3.83 percent reduction in NOx emissions for all electric utilities in the Illinois Attainment Area (counties outside of Chicago and East St. Louis nonattainment areas) between 1990 and 1999.
- 3 percent increase for total NOx emissions Statewide between 1990 and 1999.
- 1.57 percent increase between 1990 and 1999 in power plant NOx emissions within the Illinois portion of the Chicago-Gary-Lake County nonattainment area.

According to the 1990 baseline and 1999 periodic emission inventories, there was an increase of 14 tons per day in total NOx emissions for the Illinois portion of the Chicago-Gary-Lake County nonattainment area.

Illinois had received an EPA waiver for NOx reductions within its portion of the Chicago-Gary-Lake County nonattainment area on the premise that a reduction in these emissions may increase ozone levels even though these emissions potentially impacted ozone levels in Chicago and all downwind nonattainment areas such as the Milwaukee-Racine severe nonattainment area. Illinois had not implemented any controls on nonattainment area NOx sources until the NOx SIP Call reductions became effective in 2004. An OAQPS official stated that many of these waivers were granted based on questionable justifications.

# *Examples on Use of Outside Emission Credits*

Post-1996 ROP Plans for two of the three nonattainment areas claiming outside emission reductions included only the baseline emissions for the selected sources when calculating required emission reductions. However, the post-1996 ROP Plan for the third nonattainment area did include the entire emissions baseline for the outside area where emission reductions were claimed.

The Illinois post-1996 ROP Plan for the Chicago-Gary-Lake County severe nonattainment area included NOx reductions based on Tier I vehicle emission rules, Federal non-road engine standards, and the Federal Acid Rain program that occurred outside the nonattainment area. In calculating the required NOx reductions for the ROP, Illinois used the entire NOx baseline for all counties outside of the Illinois ozone nonattainment areas.

Wisconsin, in the post-1996 ROP Plan, claimed emission reduction credit of about 6.5 tons per day for certain VOC sources outside of the Milwaukee-Racine nonattainment area. These reductions were based on prior Statewide VOC rules. The State determined that VOC emissions from 14 counties outside of the Milwaukee-Racine nonattainment area affected the nonattainment area's ability to achieve the 1-hour ozone standard. For the 14-county area, the State included in ROP calculations of required VOC reductions only the 1990 baseline VOC emissions (28.53 tons per day) for autobody refinishing, degreasing, and organic solvent use. The use of baseline emissions only for these specific sources assumes that other VOC sources within the 14-county area did not increase emissions and offset or exceed any reductions by the selected sources. If the State had selected these same VOC control measures within the nonattainment area, the State would have had to calculate emission reductions and project emissions growth – per Clean Air Act statutes – against the entire anthropogenic VOC baseline for the Milwaukee-Racine nonattainment area (362 tons per day). According to the NEI, the 1990 total VOC anthropogenic emissions for the 14-county area were 119,286 tons per year, or an estimated 326.8 tons per day. However, the State included only 28.53 tons per day of these emissions in the ROP baseline. Most of the VOC reductions projected in the Milwaukee-Racine post-1996 ROP Plan resulted from controls within the nonattainment area. Therefore, to ensure VOC reductions, net of growth, for the entire area in which VOC reductions were claimed, the ROP baseline should have combined VOC baseline emissions for the 6-county Milwaukee-Racine nonattainment area and the 14-county outside area.

The New Hampshire portion of the post-1996 ROP Plan for the Boston-Lawrence-Worcester severe nonattainment area included Acid Rain NOx reductions for a specific power plant located outside New Hampshire's portion of the nonattainment area. According to the NEI, Merrimack County, New Hampshire, in which the power plant is located, had total 1990 NOx emissions of 29,338.43 tons per year, or an estimated 80.4 tons per day. The State included only the power plant's 1990 baseline NOx emissions of 26.3 tons per day in the ROP total NOx baseline of 59.7 tons per day. This NOx baseline was used to calculate required NOx reductions and project growth in NOx emissions for New Hampshire's portion of the Boston-Lawrence-Worcester area. However, limiting the outside NOx baseline to the power plant emissions assumes that other

NOx sources in the surrounding outside area would not grow and/or offset the power plant reductions. The post-1996 ROP Plan also included NOx reductions from Reasonably Available Control Technology controls within the nonattainment area. Therefore, to assure NOx reductions, net of growth, for the entire area in which emission reductions were claimed, the ROP baseline should have been the combined NOx baseline for New Hampshire's portion of the nonattainment area and Merrimack County.

# *Agency Response to Draft Report and OIG Evaluation*

*Note: The OIG's evaluation of the Agency's response appears in italics, in a box, after each comment.*

**MEMORANDUM**

SUBJECT: OIG Draft Evaluation Report
EPA and States Not Making Sufficient Progress in Reducing Ozone Precursor Emissions in Some Major Metropolitan Areas
Assignment No. 2003-0000499

FROM: Jeffrey R. Holmstead
Assistant Administrator for Air and Radiation

TO: J. Rick Beusse, Director for Program Evaluation
Air Quality Issues, OIG

Thank you for the opportunity to comment on the draft report concerning progress in reducing ozone precursor emissions in some major metropolitan areas. The report reflects a significant effort from your staff and provides insightful recommendations for our consideration. Attached is our response addressing the report and recommendations. Our response also reflects input from the EPA Office of General Counsel and several Regional Offices.

In general, some of the recommendations concerning the draft rule for milestone compliance demonstrations seem reasonable and we will investigate how they can be implemented. Other of the recommendations are good in theory, but practical considerations constrain us from implementing them. Highlights of our comments include:

- Resource constraints are a major consideration. The Office of Air and Radiation (OAR) has many statutorily required programs and resources to support those programs has remained stagnant for years. We must prioritize our efforts, putting our resources where we think we can get the most good for dollar spent. For several years now, our ozone program has focused on implementing the more health-protective 8-hour ozone standard rather than the 1-hour standard that is due to be revoked under regulation on June 15, 2005. Rather than spending resources looking back, we have chosen to focus on moving forward and developing programs and guidance that will assist states in getting the reductions necessary to meet the new standard. We believe public health will be served by this choice.

*OIG Evaluation: We agree that EPA should focus its resources on the current and future implementation of the 8-hour standard. Where possible we have focused the recommendations to future implementation actions that should help EPA and the States attain the 8-hour standard in a timely manner. However, we continue to believe that EPA needs to look closely at past implementation of the 1-hour standard to see what was accomplished and what was not accomplished, which controls worked as expected and which did not, and which aspects of their ozone strategy need improvement in order to implement the 8-hour standard more effectively than occurred under the 1-hour standard. As noted in our report, delays in implementation of 1-hour emission controls and related inadequate emission reductions have prolonged the exposure of millions of people to unhealthy ozone levels. In addition, if many nonattainment areas could not meet the 1-hour standard, attainment of the 8-hour standard will be even more complex and difficult for these areas. EPA needs to learn from the past how to better address these current and future challenges in reducing ozone precursor emissions.*

- OAR has already required large reductions in nitrogen oxides (NOx), a major precursor to ozone, through the NOx SIP call, heavy-duty diesel rule, the Tier II tailpipe rule and off-road engines. These reductions, some which have just come into play this year, go a long way toward meeting the Clean Air Act (CAA) goal of emission reductions contemplated through the rate-of-progress plans (ROP). We anticipate further reductions under the proposed Clean Air Interstate (CAIR) rule.

*OIG Evaluation: We recognize that EPA has implemented many national and regional controls that should significantly impact NOx emissions in the future. These controls should further reduce ambient ozone levels. However, these controls were not timely designed and/or implemented to meet emission reduction mandates of the Act. As a result, the effects of unhealthy ozone levels on public health have been substantially prolonged past the 1990 Act's milestones for the 1-hour ozone standard. Additionally, as indicated in our report, the effectiveness of these national and regional controls should still be measured in precursor emissions reductions at the local level, especially in those major metropolitan areas that have struggled to meet the 1-hour standard.*

- The report expresses concern that the policy allowing States to claim ROP emission reductions for sources outside the nonattainment area allows for potential double-counting of emission reductions and does not ensure that emission reductions do more than just offset emissions growth. The 1997 Ozone Transport Assessment Group analyses indicated reductions in NOx from upwind sources does, in fact, reduce ozone levels in downwind communities. This study was the basis for EPA's NOx SIP call and is more a co-benefit than a double-counting.

*OIG Evaluation: In some cases, emission reductions by sources outside nonattainment areas could benefit more than one nonattainment area. However, modeling would be required to demonstrate that the outside sources actually impacted multiple areas and to what extent each area benefitted from these reductions. In our view, the credit given in ROPs should be limited to the extent of benefit received by each nonattainment area. The current policy does not provide for or require modeling to demonstrate outside emission sources' impact on individual nonattainment areas and does not limit credit for such emission reductions to the actual benefit received by individual nonattainment areas from such reductions. Under the policy, nonattainment areas are generally allowed credit for all emission reductions achieved by outside sources within specified distances outside the nonattainment area boundaries without any demonstration of the actual impact of these specific emissions on the area's nonattainment of the ozone standard. We believe that any "double counting" or "co-benefit" of outside emission reductions by multiple nonattainment areas should be limited to the extent of benefit received by each area based on appropriate atmospheric modeling.*

If you have any questions about this response, please contact Gail Whitfield at 919-541-1451.

Attachment

cc: John Price, Office of Inspector General
Steve Page, Director, Office of Air Quality Planning and Standards, OAR
Lydia Wegman, Director, Air Quality Strategies and Standards Division, OAQPS
Peter Tsirgotis, Director, Emissions, Monitoring, and Analysis Division, OAQPS
Kay Holt, Director, Planning, Resources, and Regional Management Staff, OAQPS
Kevin McLean, Office of General Counsel
Pete Cosier, OAR Audit Coordinator
Yvonne W. Johnson, OAQPS Audit Coordinator

**Suggested changes**:

On page 3, in title of Table 1:2: after the word "Nonattainment" insert for "1-hour ozone NAAQS". In the footnote, change "designated" to "re-designated".

Also on page 3, "Twenty-one of the 25 . . . to a lower nonattainment "classification" rather than "designation".

*OIG Evaluation: The final report reflects the changes requested above.*

To the last paragraph on page 3, add "These designations because [ *sic*, became] effective for 113 of the 126 areas on June 15, 2004. The remaining 13 ("Early Action Compact" or "EAC") areas received deferred effective dates for their designations. Furthermore, one of the original 113 areas subsequently received a deferred effective date."

*OIG Evaluation: We agree with the effective dates for 8-hour designations shown above. However, we did not add this information as requested because the information did not directly relate to or provide clarification for any of the issues addressed in the report.*

On page 6, the report presents the 3% requirement in a way that implies that it is a 3% annual requirement. Actually, it is 3% per year as averaged over a 3 year period.

*OIG Evaluation: We modified the report to clarify that the 3-percent per year emission reduction requirement pertained to the average annual reduction required over each 3-year period.*

On page 33, an OGC attorney was quoted as defining their job "as attorney advisors is to find language gaps and ambiguities in statutes that allow EPA flexibility in promulgating policy guidance." *OGC attorneys are responsible for advising program offices on the legalities of various issues and providing their opinion on whether the policy or guidance in question would be successfully if challenged in court*. That is a more accurate statement of their role. OAR rules, policies and guidance are frequently challenged, both by industry and by environmentalists. When establishing policies that affect large sectors of the population, it is critical to review the legal angles. We would request that the two sentences in the middle of the page beginning "However, according . . . score given to the policy" be stricken from the report and the above italicized sentence be substituted.

*OIG Evaluation: The draft report reflects the actual statements made to the OIG by an EPA attorney who was involved in reviewing the outside emission credit policy. This statement was provided to allow the reader to understand Office of General Counsel's role in the questioned policy, and was not central to our finding that the legal basis of the policy was unclear; thus we made the changes in the final report as requested by the Agency. The OIG will refer to the Agency response as the source of the statement in the final report.*

On use of data from EPA's National Emissions Inventory (NEI) database to prove or disprove whether an area reduced its emissions by the required amount: OIG's analysis produces dubious results for several reasons. First, the Act requires that States demonstrate reductions on a tons per summer day (TPSD) basis; using the NEI only allows for one to analyze reductions using annual emissions data. This is a significant difference. Additionally, EPA's NEI database simply doesn't have the same quality of data as State-prepared inventories. Second, the draft report points out that a major failing of the NEI is its lack of documentation of methods used by the States to prepare the emission estimates. However, we would like to point out that each State's hard-copy inventory includes methods as part of the report, making them available for assessment with the inventory. Third, the draft report finds that using periodic emission inventories (PEIs) to compare back to baseline numbers is problematic: ". . . Our interviews with OAQPS, regional, and State officials disclosed that, due to changes in models, methodologies, and emissions factors over the years, a reliable comparison between baseline and periodic emission inventories could not be conducted unless both inventories were updated."

Although EPA has updated past inventory estimates to make them consistent with current estimates in various ways, such as updating past inventory year on-road emission estimates with estimates produced by the most current version of the Mobile model, such efforts still do not produce emission estimates that match SIP emission inventory estimates for all years, and again, represent annual, not daily emission values.

*OIG Evaluation: As stated in our report, the Act requires that States demonstrate that precursor emissions have been reduced an average of 3 percent annually "net of growth" for each 3-year period subsequent to the enactment of the 1990 Act. The Act does not require that States demonstrate attainment of emission reductions in "tons per summer day." Also, EPA adjusts the NEI every 3 years based on State emissions data that is expressed in tons per day or tons per summer day to a tons per year expression.*

*EPA has indicated that the NEI is the highest quality emissions data maintained by the Agency and has used this data for regulatory planning and support; national, regional, and State emission trends; and public information reports. However, the Agency now states that the NEI is not of sufficient quality to indicate whether nonattainment areas met emission reduction requirements in the Act, and asserts that State SIP inventories are best for such measurements. According to EPA documentation and our analysis, state inventory data is used every 3 years to update NEI; therefore, NEI and State emissions data should reflect the same level of quality. Further, the Agency routinely provides NEI-developed emissions data to States for their use in developing their nonattainment periodic emissions inventories, and we found at least three states had used NEI data in their periodic inventories rather than developing their own data. The Agency further asserts that State inventories cannot be used to measure nonattainment area accomplishments in reducing precursor emissions because baseline and subsequent periodic inventories were produced using different models and factors. EPA has stated that requiring updates to baseline and periodic inventories would be too burdensome on States. These contentions by EPA would leave no actual, comparable emissions data available, State or national, to assess nonattainment progress as required by the Act. However, the OIG looked for emissions data that could provide a reliable indicator as to whether nonattainment areas had achieved precursor emission reductions required by the Act. Noting that the NEI was being updated for the 1990 to 1999 period based on the latest models and emissions factors, EPA senior officials – including some regional officials – said that this updated NEI data would provide a reliable indicator of whether nonattainment areas met emission reduction mandates. This is the data we used in our analysis.*

We believe OIG has interpreted Tables 3.1 and 3.2 in the report incorrectly when they say "Negative differences between the target levels and PEIs for seven nonattainment areas indicate that the target levels were underestimated." This indicates OIG believes that projected emission inventories are used in the establishment of target emission levels, and therefore that underestimates of the projected emissions can cause ROP shortfalls because it leads to inadequate planning for emission reductions. In fact, projected emission estimates aren't used in establishing the target level. Target levels are directly determined by subtracting the required ROP reductions, non-creditable reductions, etc. from the baseline inventory. It's a straight subtraction of known amounts from a known baseline. It can be miscalculated, but not underestimated. It would be true to say that "negative differences between **projected, controlled emission levels** and PEIs indicate that growth may have been underestimated, and so not enough emission reductions were planned for." But it's incorrect to say that negative differences target levels and PEIs indicate target levels were underestimated.

*OIG Evaluation: The OIG did not use projected emission inventories in either Table 3.1 or 3.2. Actual, "calculated" target levels, as documented in the 15-percent and post-1996 ROP Plans, were used in these tables to show differences between actual periodic emission inventories and calculated target inventories.*

*The OIG agrees that the draft report statement cited by the Agency is not technically correct. The total emission reductions needed to achieve the target levels were under projected, not the target levels. The cited sentence has been changed to read: "Negative differences between the target levels and PEIs for seven nonattainment areas indicate that the growth of projected emissions may have been underestimated and ROP emission controls and related reductions, (to include emissions growth) were inadequate to achieve the subject target levels."*

**Regarding Recommendations**:

Chapter 2:

2-1 Perform an in-depth evaluation of the compliance of all serious to extreme nonattainment areas with emission reduction requirements using, at a minimum, precursor emissions data contained in the Agency's NEI database.

*Response:* OAR has chosen to focus its efforts on developing plans and strategies that will implement the more health-protective 8-hour standard rather than evaluate progress toward the 1-hour standard which is scheduled to be revoked on June 15, 2005. Since EPA will no longer be determining whether areas have met their 1-hour ROP milestones after June 15, 2005, it seems more appropriate to focus our efforts and our resources on implementing the 8-hour ozone rule. Implementation rules will incorporate development of the ROP plans and assessing progress toward those plans.

*OIG Evaluation: We agree that the Agency should focus resources on implementation of the 8-hour standard. However, the Agency and States need to measure and assess the actual effectiveness of controls implemented under the 1-hour standard before developing controls for the 8-hour standard. This assessment could be a valuable tool in identifying controls that were not effective, overestimates of projected emission reductions, and methods for increasing the effectiveness of controls in 8-hour ROPs.*

*Many new nonattainment areas were designated under the 8-hour standard. These areas will be implementing many of the emission controls already implemented by 1-hour nonattainment areas. EPA needs to know how effective these 1-hour controls were in reducing emissions and identify where improvements may be needed before developing 8-hour emission control plans for these areas. An assessment of actual reductions achieved by 1-hour controls could identify the need for EPA to adjust the expected emission reductions from these controls and/or the need to develop alternative controls to meet 8-hour milestones. A more viable method for assessing control effectiveness is to measure emission reductions that actually occurred from implementation and compare reductions achieved to the projected or expected reductions included in 1-hour plans. Finally, EPA needs to identify 1-hour areas that did not achieve required emission reductions for the 1-hour standard and implement all available contingency measures. Implementation of contingency measures should further reduce emissions in these areas and better facilitate the achievement of the more stringent 8-hour standard for areas that have struggled for years to meet the less stringent 1-hour standard. Therefore, we continue to believe that the recommendations in Chapter 2 are valid, realistic actions that EPA needs to take to ensure a more effective implementation of the 8-hour standard.*

2-2 Implement contingency measures, where appropriate, if nonattainment areas have not met the Act's emission reduction requirements, including the use of enforcement and/or sanctions as authorized under Section 185 of the Act.

*Response:* Section 182(g)(3) – not the enforcement or sanctions provisions of the Act – establishes the process for when a serious, severe, or extreme area has not met the emission reduction obligations in a ROP plan. Under this provision, if an area has not met the emission reduction targets, the statute provides three options for the state:

- to have the area reclassified to the next higher classification,
- to implement specific additional measures adequate, as determined by the Administrator, to meet the next milestone as provided in the applicable contingency plan, or
- to adopt an economic incentive program as described elsewhere in the Act.

The Administrator may require the state to adopt additional controls only if he/she determines that the state-selected option is inadequate. Additionally, we note the provision referenced in the report, section 185, applies only when a severe or extreme nonattainment area fails to attain the standard by the area's attainment date. This provision does not apply to areas that fail to meet ROP milestones.

*OIG Evaluation: We agree that Section 185 only pertains to sanctions for failure of a severe or extreme nonattainment area to attain the ozone standard by the statutory attainment date. This statutory reference was changed in the final report. However, Section 179 indicates that sanctions may be taken if an area fails to submit an adequate ROP that will attain the required reductions by the applicable milestone date and if an area fails to adequately implement ROPs. As indicated in the report, some ROP controls were not timely or adequately implemented in order to attain required emission reductions by statutory milestone dates.*

Chapter 3

3-1 Develop oversight procedures and guidance that will expedite development, approval, and implementation of ROP Plans and related emission controls.

*Response:* Consistent with our focus on implementation of the 8-hour standard, EPA has proposed options for addressing the ROP requirement for areas covered under subpart 2 and intends to issue a final rule (the phase 2 portion of the 8-hour ozone implementation rule) that would cover development and approvability of the ROP plans and the timing of emission controls.

*OIG Evaluation: The OIG appreciates EPA's efforts to address the need for better oversight procedures and guidance as it simultaneously develops its final rules for implementing the 8-hour ozone standard; however, we continue to believe that new oversight procedures and guidance need to be developed that specifically show how the new 8-hour procedures and guidance will improve the development and implementation of 8-hour ROPs as compared to 1-hour ROPs that were the subject of our evaluation.*

3-2 Require evaluation of proposed ROP Plans by EPA regional air programs to assure the propriety of ROP assumptions, projections, and related emission reductions in comparison to available emission databases and historical data.

*Response:* The Regional Offices have responsibility for reviewing all aspects of SIPs, including the ROP plans. OAR also includes this as an item in the annual guidance issued to Regions and States.

*OIG Evaluation: The OIG recognizes that regions have the responsibility for reviewing State SIP submissions. However, as pointed out in Chapter 3, EPA Regions did not always throughly review State support for ROP Plans. We continue to believe that EPA needs to require regions to perform in-depth reviews of State technical support for ROP submissions.*

3-3 Develop guidance for analyzing and comparing periodic emission inventories to projected emission target levels and evaluating assumptions used in applicable ROP Plans, in order to: (1) reconcile differences between projected and actual inventories, (2) identify any incorrect assumptions or projections and understatement of needed emission reductions, and (3) establish improvements that may be needed in the ROP development process, and ensure training of staff in conducting these analyses.

*Response:* As noted in the draft report on page 39, OAQPS is developing a rule for the compliance milestone demonstration for the 8-hour ozone standard. In the process of developing that rule, OAQPS intends to address this recommendation.

*OIG Evaluation: The OIG appreciates EPA's efforts to address the need for better oversight procedures and guidance for milestone compliance demonstrations as it simultaneously develops its final rules for implementing the 8-hour ozone standard.*

3-4 When EPA staff determine that an understatement [sic; may have meant "overstatement?"or "underachievement"] of emission reductions has occurred, require States to implement contingency or other measures needed in a timely manner to ensure that required emission reductions are achieved.

*Response:* As noted above in response to recommendation 2-2, Section 182(g)(3) – not the enforcement or sanctions provisions of the Act – establishes the process for when a serious, severe, or extreme nonattainment area has not met the emission reduction obligations in an ROP plan. Under this provision, if an area has not met the emission reduction targets, the statute provides three options for the state:

- to have the area reclassified to the next higher classification,
- to implement specific additional measures adequate, as determined by the Administrator, to meet the next milestone as provided in the applicable contingency plan, or
- to adopt an economic incentive program as described elsewhere in the Act.

The Administrator may require the state to adopt additional controls only if he/she determines that the state-selected option is inadequate. Additionally, we note the provision referenced in the report, section 185, applies only when a severe or extreme nonattainment area fails to attain the standard by the area's attainment date. This provision does not apply to areas that fail to meet ROP milestones.

*OIG Evaluation: While we appreciate the Agency's views, the response did not address the content of this recommendation, as Section 185 of the Act is not a part of this recommendation. The OIG's recommendation only provides that EPA should require implementation of contingency measures, as required under Section 182(g)(3), when an area has not met emission targets. As shown in Chapter 3, our comparison of PEIs to target emission levels, indicated that many nonattainment areas did not achieve emission targets. The recommendation did not provide, as stated in OAR's response, that EPA require States to implement additional controls, only implementation of contingency measures that should have already been included in approved ROPs and ozone attainment demonstrations.*

3-5 Revise EPA's "Clean Data" policy to require meteorologically adjusted ozone trend analyses and trend analyses of ambient VOC and NOx concentrations for nonattainment areas that attain the ozone standard based on ambient ozone monitoring data, to better assure the permanence of such attainments before suspending ROP Plan development and approval.

*Response:* OAQPS is evaluating incorporating these recommendations into the Clean Data Policy.

*OIG Evaluation: The OIG appreciates EPA's efforts to address these recommendations as it revises the Clean Data Policy.*

3-6 Require that EPA make and publish a determination that the ozone standard has been achieved through permanent and enforceable emission reductions before suspending ROP Plans and related emission reductions required by the Act.

*Response:* Current EPA guidance for redesignation to attainment requires a determination that the reductions are permanent; EPA will reassess the Clean Data Policy to determine whether such a determination can be incorporated into that policy.

*OIG Evaluation: The OIG appreciates EPA's efforts to address these recommendations as it revises the Clean Data Policy.*

Chapter 4

4-1 Subject the policy claiming outside emissions to the notice-and-comment rulemaking process, which will allow broad public comment and feedback.

*Response:* Each time the Agency approves a SIP that relies on the policy allowing , the public has an opportunity to comment on the reliance on reductions from outside the nonattainment area.

*OIG Evaluation: We agree that ROP notices could allow public comment. However, the policy has only been referenced in ROP notices and not presented in detail for public comment. Additionally, ROP notices are usually long and complex and the use of outside emission reductions are buried within this long, technically complex document. The public has received few details regarding the policy in past ROP notices. The ROPs did not present a clear picture of the impact of this policy on nonattainment area emissions or any information on the statutory basis for the policy under the Act. Therefore, the OIG continues to consider Recommendation 4-1 valid.*

4-2 Revise policy for nonattainment area outside emission reduction credit to:

- Encourage broadening of controls for sources in outside areas in order for a nonattainment area to claim emission reduction credits.
- Require atmospheric modeling to support the impact of outside emissions and sources on nonattainment area ozone levels.
- Require that the emission baselines from all selected outside areas be included in ROP baseline emissions for calculating required emission reductions and measuring achievement of reductions.

- Provide a methodology for apportioning outside area NOX or VOC emissions reductions among nonattainment areas to prevent double-counting of emission reductions when a State has multiple nonattainment areas.
- Require that outside sources or areas included in post-1996 ROPs also be included in subsequent PEIs for each applicable nonattainment area.

*Response:* As part of the rulemaking process implementing the 8-hour ozone standard, the Agency is assessing existing policies and guidance. We will take these comments into consideration, along with other comments received from stakeholders, as we proceed with implementation of the 8-hour ozone NAAQS. Also, Federal rules such as the NOx SIP call, new vehicle standards, and the proposed CAIR rule will provide emission reductions that will significantly reduce ozone levels in many of these areas and promote adequate ROP. Since upwind sources are known to contribute to downwind ozone pollution, controlling these source through regional programs will contribute to reducing the ozone levels in more than one nonattainment area. That isn't double-counting.

*OIG Evaluation: We appreciate OAR's plans to consider Recommendation 4-2 during its assessment of existing policies and guidance as part of the rulemaking process for implementation of the 8-hour standard.*

Chapter 5

5-1 Expedite issuance of the milestone compliance guidance, but restrict the use of observed ambient ozone levels as a stand-alone indicator of emission reductions. The guidance should also require the use of meteorologically adjusted ozone trends and trends in ambient concentrations of VOC and NOX in the weight of evidence approach.

*Response:* We will evaluate the current draft milestone compliance rule to determine the feasibility of this recommendation. We must remember our overall goal is to meet the health-protective air quality standard for ozone, not just reduce precursor emissions. The ROP is a tool designed to help areas meet the standard, it is not the measure used for designation of areas as attainment or nonattainment.

5-2 Instruct States to utilize indicators, as reflected in the draft milestone compliance demonstration guidance, and/or provide annual updates to emissions inventories (one third of sources per year or one third of States per year) to determine potential or actual emission reductions within the Act's 90-day time frame for milestone compliance demonstrations.

*Response:* In the draft of the proposed rule, EPA is contemplating reliance on indicators to meet the milestone compliance demonstration. At this time, it is not technically feasible for States to complete quality assured emissions inventories for most source categories based on actual emissions generating activities in a 90-day time frame.

*OIG Evaluation: Emission inventories are the best measure of actual emission reductions. Indicators will not provide assurance that emissions have been sufficiently reduced to meet the requirements of the Act. Updated inventories should be used as part of the milestone demonstration whenever feasible.*

5-3 Require that nonattainment areas update baseline inventories and, subsequently, perform more in-depth assessments of actual emission reductions, once the applicable PEIs are completed. This subsequent determination of actual emission reductions may not meet the milestone compliance demonstration 90-day time frame but will provide a measure of progress that is not currently available.

*Response:* We believe that the IG is recommending that OAR should require that whenever a state has revised an emission inventory model or method, for example a method of estimating emissions from mobile sources, as part of preparing the PEI, the baseline inventory (e.g., for 2002 in the case of an 8-hour ozone area) should be recalculated with the new method so that actual reductions from base year to PEI year can be estimated without the confounding influence of method changes.

Assuming our interpretation of this recommendation is correct, we appreciate the issue. However, we are not certain that we have legal authority to require a state to revise its baseline inventory once submitted, or that it would be the best use of state and EPA resources in all cases. For some changes in method, it may be technically impossible to re-estimate the baseline inventory years later, for example, if source testing methods change. We address the intercomparison issue on a case-by-case basis when, during review of a PEI submittal, it seems material to the area's progress toward attainment.

*OIG Evaluation: The OIG did not intend, as suggested in the Agency's response above, that States update baseline inventories each time a new model or factor is promulgated. The recommendation provides that States should update baselines in order to be comparable to the most recently developed PEI, so that actual emission reductions achieved can be measured. The OIG continues to believe that this additional requirement would provide a realistic measure of emission reduction achievements under the 8-hour standard and, as such, would also represent an effective use of Agency resources to achieve the 8-hour standard. The use of indicators alone will not fully meet the Act's requirement that States demonstrate the attainment of specific, mandated precursor emission reductions for each nonattainment area.*

5-4 Incorporate the use of updated NEI data and other available measures, where appropriate, into milestone compliance demonstration guidance as top-down indicators or measures of nonattainment area progress in reducing precursor emissions.

*Response:* We will evaluate the current draft milestone compliance rule to determine the feasibility of this recommendation.

*OIG Evaluation: We appreciate OAR's plans to consider Recommendation 5-4 during its assessment of milestone compliance guidance as part of the rulemaking process for implementation of the 8-hour standard.*

5-5 Require State and local agencies to update past baseline and periodic emission inventories based on the latest models, emission factors, and methodologies, and complete milestone compliance demonstrations for 1990 through 1999 (or later milestone year) for

nonattainment areas based on the issued milestone compliance guidance. Further, for future inventories, require States to continuously update inventories as new emissions data and methods are developed, to provide timely assessments of nonattainment area progress in reducing precursor emissions.

*Response:* The focus of the EPA ozone program is on implementation of the more protective 8-hour standard, including guidance on the ROP program. We do not feel it would be a good expenditure of our resources to document progress or failures against the 1-hour standard that will be revoked under regulation on June 15, 2005.

*OIG Evaluation: As previously stated in response to Recommendation 2-1, we believe that if the Agency better understands nonattainment area progress in reducing emissions under the 1-hour standard, it can more effectively design and implement emission controls under the 8-hour standard. In our view, determining how to implement the 8-hour standard more effectively than occurred with the 1-hour standard represents an effective use of resources.*

Chapter 6

6-1 Develop analytical procedures and processes for EPA and/or States to utilize updated NEI data for measuring the progress of individual areas in reducing precursor emissions and complying with the Act's emission reduction mandates.

*Response:* We are broadly examining the issues of program tracking, assessment, and accountability in response to the recent National Academy of Sciences committee report on air quality management. To be clear, any policy, procedures, or guidance we would issue at this point would support implementation of the 8-hour NAAQS.

*OIG Evaluation: This recommendation was intended to address future EPA and State analyses of NEI to determine the progress of nonattainment areas in reducing precursor emissions. The recommendation is directly related to implementation of the 8-hour standard and measurement of emission reductions by individual nonattainment areas under this standard. We have modified the recommendation in the final report to indicate that actions recommended apply to the 8-hour standard.*

6-2 Issue guidance for the development of meteorologically adjusted ozone trends for individual nonattainment areas, updated annually, to better isolate the impact of emission reductions on ozone levels.

*Response:* While EPA has developed and used approaches to meteorologically adjust ozone trends (e.g., EPA 454/K-04-001, http://www.epa.gov/airtrends/ozone.html), adjusted trends for specific areas or regions may not adequately adjust for all influences caused by meteorology. We are exploring more sophisticated adjustments and when a better approach is developed and demonstrated, we will make it available to States.

*OIG Evaluation: In 2003, the EPA developed meteorologically adjusted ozone trends for major United States metropolitan areas, many of which are ozone nonattainment areas. An EPA analyses of these trends was included in publically released reports. If EPA's prior meteorologically-adjusted trends for many large nonattainment areas were sufficiently reliable to be included in EPA's ozone trends reports, we do not understand the need for more sophisticated adjustments before utilizing the approach as an indicator of the impact of emission reductions on ozone levels. More precise measures of meteorologically-adjusted ozone levels would improve the approach as an indicator but the current approach has already been deemed by EPA as sufficiently reliable for trends analyses and public information.*

6-3 Provide resources to develop PAMS data analyses and identify trends in ambient VOC and NOx concentrations for individual ozone nonattainment areas. Such trends could be used to assess the effectiveness of Federal, regional, and local emission controls and identify where additional controls may be warranted.

*Response:* This is a resource allocation issue. The EPA has intermittently analyzed PAMS data for special studies but such analyses have been a lower priority during the last few years than other air quality analyses for ozone and fine PM. However, we re-initiated PAMS data analysis in FY 2004. This analysis will involve technical challenges in relating ambient VOC concentrations to various meteorological factors influencing emissions and atmospheric transformations, and developing statistical relationships with factors such as activity levels and regional transport. This approach will likely require an iterative, exploratory analysis to determine the most relevant factors in evaluating the effectiveness of control programs and identifying additional control measures. In addition, there are PAMS siting "gaps" as not all 8-hour ozone nonattainment areas participate in this program. Considering these challenges, we are committed to PAMS data analysis provided sufficient resources can be allocated to PAMS data acquisition and analysis.

*OIG Evaluation: The older 1-hour nonattainment areas already have PAMS networks. Therefore, PAMS data for these areas is already available for trend analysis to identify the direct impact of emission reductions on ambient concentrations of ozone precursor emissions. PAMS is probably one of the best methods available to assess the direct impact and effectiveness of emission controls on individual nonattainment areas. We agree that the Agency should pursue the resources necessary to perform PAMS data/trend analyses for individual nonattainment areas.*

Chapter 7

7-1 Establish annual and multi-year goals and performance measures for ozone precursor emission reductions by individual nonattainment areas and require State and local agencies to submit evidence that these goals have been met.

*Response:* The Agency's 2003 Strategic Plan includes objectives regarding ozone improvements for nonattainment areas. Sub-objective 1.1.1 states that by 2010 air quality with respect to 8-hour ozone will be improved to heathy levels (i.e., meet the NAAQS) for 60 percent of the people who live in areas not meeting the national standard in 2001. The objective further states that air

quality will improve for an additional 27 percent of the people who live in areas not meeting the 8-hour standard in 2001.

7-2 Once annual goals and measures are established, include the goals and measures in EPA and State and local agencies' annual and strategic plans, and provide accomplishments toward these goals in EPA's annual performance reports.

*Response:* The Agency's goals, objectives, and performance measures are based on the broader overall goal of protecting public health, and as such, reflect measuring areas and population with clean air for the various criteria pollutants. Our instructions from OMB are that the goals be meaningful. We feel we are doing this by addressing the public health issue.

The State implementation plans (SIP) for nonattainment and maintenance areas; specifically attainment demonstrations, rate-of-progress plans, and maintenance plans, provide emission targets for each of the ozone precursors. These targets are approved as part of the SIP rulemaking process. In the case of on-road mobile source sector, these targets are "budgets" that are used in implementing the transportation conformity requirements.

*OIG Evaluation: The Agency suggests that its strategic planning activities were already sufficient to address recommendations 7-1 and 7-2; however, our recommendations pertain to establishing performance measures for precursor emission reductions (NOx and VOCs) by individual nonattainment areas. As noted in our report, ambient ozone is our most complex, difficult to control, and pervasive urban air pollutant. In recognition of this fact, the 1990 Act mandated ever increasing levels of precursor emissions reductions until attainment is achieved. Thus, we continue to believe that Recommendation 7-1 is appropriate and necessary to assuring timely and permanent ozone attainment. For Recommendation 7-2, EPA indicated that the Agency's strategic goals, objectives, and performance measures reflect the broader goal of protecting public health and, thereby, the measurement of areas and populations with clean air for criteria pollutants. While we appreciate these larger goals, we believe the Agency strategic and annual plans should also include goals for reducing ozone precursor emissions in accordance with the 1990 Act. Current Agency strategic and annual plans include goals for NOx emission reductions from power plants, as well as VOC and NOx emission reductions from stationary and mobile sources based on Federal rules.*

Chapter 8

8-1 Develop DQOs, using EPA DQO development guidance, for State- and NEI-generated emissions data for use in applicable QAPPs.

*Response:* In FY 2005, EPA will develop data quality objectives (DQOs) for the 2002 NEI as part of the development and finalization of the Quality Assurance Project Plan (QAPP) for the 2002 NEI and then may consider the role these DQOs – or an augmented version of them – should play with respect to state-generated emission inventories. The DQOs will be used in future versions of the NEI (i.e., 2005 version and beyond).

8-2 Expedite completion and approval of the draft QAPP for NEI data.

*Response:* EPA will finalize the draft QAPP for the 1999 NEI by the end of this calendar year. We will develop a separate, improved QAPP for the 2002 NEI. This will complement the planned first-ever external peer review of the 2002 NEI.

8-3 To the extent possible, expedite the regulatory process for releasing ozone DQOs for use in State air monitoring QAPPs.

*Response:* These DQOs were developed for ozone monitoring and are part of the regulatory change to EPA's ambient air quality monitoring requirements implementing the National Monitoring Strategy. These changes will be proposed in 2005.

8-4 Inform EPA regions that approved State QAPPs are needed for emissions and ozone air monitoring data air monitoring data accumulated or developed by States within each region's boundaries.

*Response:* EPA QA Policy has had a long standing requirement for QAPPs for any organization accepting federal funds for the collection of environmental data. The Regions are aware of this requirement. OAQPS has developed a format for collecting information from the Regions assessing the State, Local and Tribal QAPPs for the Ambient Air Quality Monitoring Program within the Region. We will soon be working with Regional Offices to compile this assessment information.

*OIG Evaluation: We appreciate EPA's plans to develop data quality objectives for ozone precursor emissions data and ensure their use in State and national emissions inventories as expeditiously as practicable.*

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