1.0 OZONE SIP INTRODUCTION AND BACKGROUND

1.1 Purpose

On June 15, 2004, the United States Environmental Protection Agency (USEPA) finalized attainment/nonattainment designations for the 8-hour ozone National Ambient Air Quality Standards (NAAQS). The entire state of New Jersey is associated with two multi-state nonattainment areas (the Northern New Jersey/New York/Connecticut nonattainment area and the Southern New Jersey/Philadelphia nonattainment area). These designations triggered the Clean Air Act (CAA) requirement, Section 110(a)(1) (42 U.S.C. § 7410(a)(1)), that states submit attainment demonstrations for their nonattainment areas to the USEPA by no later than three years after the promulgation of a NAAQS. USEPA Guidance states that states must submit attainment demonstrations for their nonattainment areas to the USEPA by no later than three years from the effective date of designation.[1] This means that this 8-hour ozone attainment demonstration State Implementation Plan (SIP) is due to USEPA by June 15, 2007. The purpose of this proposed State Implementation Plan (SIP) revision is to meet that requirement by presenting New Jersey's plan for attaining the 8-hour ozone NAAQS by its attainment date of June 15, 2010.

1.2 Background

1.2.1 Clean Air Act

The federal Clean Air Act provides the USEPA with the authority to set primary and secondary standards for criteria air pollutants. The primary standard protects human health, and the secondary welfare standard is designed to protect against any potential environmental and/or property damage. These standards are known as the National Ambient Air Quality Standards, or NAAQS. The criteria pollutants covered by the NAAQS are ozone, sulfur dioxide (SO_2), particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$), lead, oxides of nitrogen (NO_x), and carbon monoxide. The 1990 Clean Air Act Amendments furthered the mission to reducing air contaminants nationwide by addressing interstate movement of air pollution, emissions control measures, permits, enforcement, deadlines, and public participation to achieve and maintain those air quality standards.

When an area does not meet the NAAQS for one or more criteria pollutants, the area is subject to the formal rulemaking process by the USEPA, which designates the area as nonattainment for that pollutant. The Clean Air Act further classifies ozone, carbon monoxide, and some particulate matter nonattainment areas based on the magnitude of an area's air quality problem. Nonattainment classifications are used to specify what air

[1] USEPA. Guidance on the Use of Models and Other Related Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS. United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions, Monitoring, and Analysis Division, Air Quality Modeling Group, Research Triangle Park, NC, EPA-454/R-05-002, October 2005.

pollution reduction measures an area must adopt, and when the area must reach attainment. The technical details underlying these classifications are discussed in the Code of Federal Regulations, Part 81 (40 C.F.R. Part 81).

Section 179 (42 U.S.C. § 7509) of the Clean Air Act requires automatic sanctions when a state fails to submit a timely and approvable plan or fails to fully implement its commitments. First, the State would face serious economic development constraints. Specifically, the USEPA would order that any proposed new air pollution source in the state secure double the offset of the emissions it might produce before it can be permitted. Second, the state would be exposed to sanctions that could result in the loss of New Jersey's federal transportation funds. These sanctions must be applied unless the deficiency is corrected within 18 months after a finding of failure or disapproval. Additionally, Section 110(c) (42 U.S.C. § 7410) of the Clean Air Act requires that the USEPA impose a federal implementation plan (FIP) if a state fails to complete and submit a revised submission within 24 months of the failure to submit or implement a SIP.

1.3 Ozone National Ambient Air Quality Standards

1.3.1 1-Hour Ozone

In 1971, the USEPA established the NAAQS for ozone of 0.08 parts per million (ppm), measured as a 1-hour average concentration. In 1979, the NAAQS for ozone was revised to 0.12 parts per million (ppm). The 1-hour ozone standard remained 0.12 ppm until 1997 when the USEPA replaced the 1979 standard with an 8-hour standard set at 0.8 ppm[2,3](see Section 1.3.2). The entire State of New Jersey was designated by the USEPA as nonattainment for the 1-hour ozone NAAQS, and was split into four nonattainment areas. The New Jersey counties included in each of those 1-hour nonattainment areas, as well as their classifications under Subpart 2 of the Clean Air Act, is detailed in Table 1.1 in Section 1.3.2.

The Clean Air Act contains two sets of provisions – Subpart 1 and Subpart 2 – which address planning, attainment and control requirements for ozone nonattainment areas.[4] Subpart 1, referred to as "basic" nonattainment, contains general, less prescriptive, requirements for nonattainment areas for any pollutant – including ozone – governed by a NAAQS. Subpart 2 sets forth a classification scheme for ozone nonattainment areas and

[2] USEPA. History of Ground-level Ozone Standards. United States Environmental Protection Agency, http://epa.gov/oar/ozonepollution/history.html. Last updated March 6, 2007.
[3] On June 15, 2005 the 1-hour ozone standard was revoked for all areas except the 8-hour ozone nonattainment Early Action Compact Areas (EAC) areas (those do not yet have an effective date for their 8-hour designations). Source: USEPA. Green Book: 1-Hour Ozone Information. United States Environmental Protection agency, http://www.epa.gov/oar/oaqps/greenbk/oindex.html. Last updated April 9, 2007.
[4] A description of subpart 1 and subpart 2 are found in Title I, part D

provides more specific requirements for ozone nonattainment areas.[5] Under subpart 2, areas are classified based on their ozone design value.[6] Control requirements depend on the subpart 2 classification of the area. Areas with greater levels of ozone pollution are subject to more prescriptive requirements and are given longer to attain the standard. The requirements are designed to bring areas into attainment by their specified attainment dates. For 1-hour ozone, all of the New Jersey-associated nonattainment areas were classified under Subpart 2 of the Clean Air Act.

The State has been successful over the years in reducing ozone levels throughout New Jersey. One-hour ozone design values in New Jersey have declined substantially over time. The maximum 1-hour ozone average concentration recorded in New Jersey in 1988 was 0.218 ppm, compared to a maximum of 0.119 ppm in 2004.[7] In fact, of the 14 ozone monitoring sites that were operated during the 2004 ozone season in New Jersey, none recorded levels above the 1-hour standard of 0.12 ppm during the year. Most recently, all but one New Jersey monitor (at 0.125 ppm) met the 1-hour ozone standard in 2006.

Monitoring data for the 1-hour ozone nonattainment areas associated with Philadelphia and New York City demonstrate that the states within those nonattainment areas have made great progress in reducing ozone precursor levels through the implementation of control strategies, substantially reducing ozone concentrations and exceedances in the region under the 1-hour ozone NAAQS. New Jersey implemented all the measures required by the 1990 Clean Air Act Amendments to meet the 1-hour ozone standard, and has further implemented all the VOC and NO_x reduction strategies committed to under the USEPA's shortfall analysis.[8]

The USEPA revoked the 1-hour ozone standard for all areas except the 8-hour ozone nonattainment Early Action Compact Areas (EAC) areas (which did not include any New Jersey-associated nonattainment areas) on June 15, 2005.[9] This revocation occurred prior to the attainment dates for the two severe 1-hour ozone nonattainment area associated with Philadelphia (2005) and New York City (2007). For more information about the 1-hour ozone standard and revocation, see Chapter 11.

[5] For more information on the subpart 2 classification and requirements see "State Implementation Plans; General Preamble for the Implementation of Title I of the CAA Amendments of 1990; Proposed Rule." April 16, 1992 (57 Fed. Reg. 13498 at 13501 and 13510).
[6] A design value is the monitored reading used by the USEPA to determine an area's air quality status; e.g., for ozone, the fourth highest reading measured over the most recent three years is the design value.
[7] NJDEP. 2004 Ozone Summary, 2004 Air Quality Report. New Jersey Department of Environmental Protection, Bureau of Air Monitoring, 2005.
[8] NJDEP. Mid-Course Review for the New Jersey Portion of the Philadelphia-Southern New Jersey and New York Northern New Jersey 1-Hour Ozone Nonattainment Areas. New Jersey Department of Enivronmental Protection, Bureau of Air Quality Planning, January 2005.
[9] 40 C.F.R. Part 81, Subpart C.

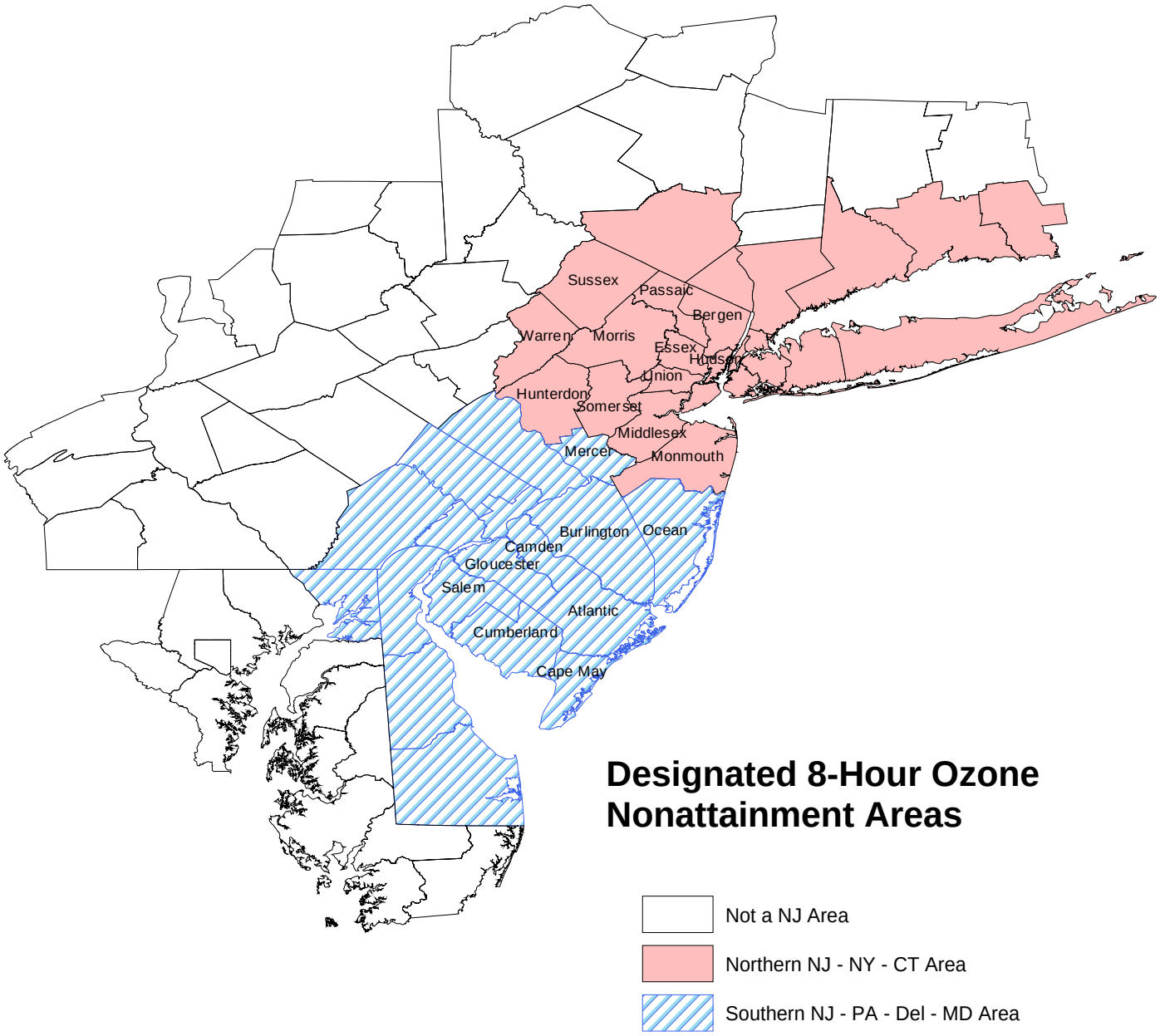
1.3.2 8-Hour Ozone

In 1997, the USEPA revised the NAAQS for ozone, setting it at 0.08 ppm averaged over an 8-hour time frame. The USEPA set the 8-hour ozone standard based on scientific evidence demonstrating that ozone causes adverse health effects at lower ozone concentrations, over longer periods of time, than the then-existing 1-hour ozone standard. The USEPA determined that the new 8-hour standard would be more protective of human health, protecting everyone at risk from ozone exposure, especially children and adults who are active outdoors, and individuals with pre-existing respiratory disease, such as asthma.[10]

In April 2004, the USEPA finalized its attainment/nonattainment designations for areas across the country with respect to the 8-hour ozone standard. These actions took effect on June 15, 2004. The New Jersey counties of Bergen, Essex, Hudson, Hunterdon, Middlesex, Morris, Monmouth, Passaic, Somerset, Sussex, Union and Warren are associated with the New York-Northern New Jersey-Long Island, NY-NJ-CT 8-hour nonattainment area (hereafter referred to as the Northern New Jersey/New York/Connecticut nonattainment area). The New Jersey counties of Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Ocean, Mercer and Salem were associated with the Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD 8-hour nonattainment area (hereafter referred to as the Southern New Jersey/Philadelphia nonattainment area). Figure 1.1 shows the entire multi-state 8-hour ozone nonattainment areas associated with New Jersey.

[10] The USEPA is currently re-evaluating the ozone NAAQS to determine if they continue to be protective of human health and welfare. More information about this re-evaluation process can be found at http://www.epa.gov/ttn/naaqs/standards/ozone/s_o3_cr_sp.html.

Figure 1.1: New Jersey-Associated 8-hour Ozone Nonattainment Areas



Under the USEPA's Phase I 8-hour ozone implementation rule, published on April 30, 2004,[11] an area was classified under Subpart 2 based on its 8-hour design value if it had a 1-hour design value at or above 0.121 ppm (the lowest 1-hour design value in Table 1 of subpart 2).[12] Based on this criterion, both multi-state 8-hour ozone nonattainment areas associated with New Jersey were classified under Subpart 2 as moderate. Table 1.1 compares the New Jersey portion of the 8-hour nonattainment areas and their classifications under Subpart 2 to the New Jersey portion of the 1-hour nonattainment areas and their classifications under Subpart 2. For subsequent action on the Phase I 8-hour ozone implementation rule, see Chapter 11. The USEPA Phase II 8-hour ozone implementation rule, published on November 9, 2005, addressed the control obligations that apply to areas classified under Subpart 2.

[11] 69 Fed. Reg. 23951-24000 (April 30, 2004)

[12] For the 1-hour ozone NAAQS, design value is defined at 40 C.F.R. Part 51.900(c), which states that 1-hour ozone design value is the 1-hour ozone concentration calculated according to 40 CFR part 50, Appendix H and the interpretation methodology issued by the Administrator most recently before the date of the enactment of the CAA Amendments of 1990. For the 8-hour ozone NAAQS, design value is defined at 40 C.F.R. 51.900(d), which states that 8-hour ozone design value is the 8-hour ozone concentration calculated according to 40 CFR part 50, Appendix I.

Table 1.1: New Jersey-Associated Ozone Nonattainment Areas – Designations and Classifications[13]

Area Name	New Jersey 1-Hour County Designations	New Jersey 1-Hour Classifications	New Jersey 8-Hour County Designations	New Jersey 8-Hour Classifications
New York-N. New Jersey-Long Island, NY-NJ-CT	Bergen Essex Hudson Hunterdon Middlesex Morris Monmouth Ocean Passaic Somerset Sussex Union	Severe	Bergen Essex Hudson Hunterdon Middlesex Morris Monmouth Passaic Somerset Sussex Union Warren	Moderate
Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD	Burlington Camden Cumberland Gloucester Mercer Salem	Severe	Atlantic Burlington Camden Cape May Cumberland Gloucester Ocean Mercer Salem	Moderate
Allentown-Bethlehem-Easton, PA-NJ	Warren	Marginal	*	*
Atlantic City, NJ	Atlantic Cape May	Moderate	**	**

* included in the Northern New Jersey/New York/Connecticut nonattainment area
**included in the Southern New Jersey/Philadelphia nonattainment area

1.4 Health Effects and Welfare Impacts

1.4.1 Ozone

Ozone continues to be New Jersey's most pervasive air quality problem. Although the ozone found in the earth's upper atmosphere (stratosphere) forms a protective layer from the sun's ultraviolet radiation, the ozone formed near the earth's surface (troposphere) is inhaled by or comes in contact with people, animals, crops and other vegetation, and can cause a variety of health and other effects. Ozone is a highly reactive gas. In the

[13] 69 Fed. Reg. 23921 (April 30, 2004).

troposphere, it is formed by complex chemical reactions involving oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the presence of sunlight.

Ozone causes health problems because it damages lung tissue, reduces lung function, and sensitizes the lungs to other irritants. Ozone has long been known to increase the incidence of asthma attacks in susceptible individuals. Ozone exposure also makes the lungs more vulnerable to lung diseases such as pneumonia and bronchitis. Ozone not only affects people with impaired respiratory systems, such as asthmatics, but healthy adults and children as well. Exposure to ozone for several hours at relatively low concentrations significantly reduces lung function and induces respiratory inflammation in normal, healthy people during exercise. This decrease in lung function is generally accompanied by symptoms such as chest pain, coughing, sneezing, and pulmonary congestion. Recent research in southern California strongly suggests that, in addition to exacerbating existing asthma, ozone also causes asthma in children.[14] Longer-term exposure to ozone can also lead to scarring of the lung tissue and permanent reductions in lung capacity.[15] Long-term exposure to ozone can eventually lead to premature death.[16]

Besides its impact on human health, ozone also has environmental impacts. Specifically, ozone interferes with the ability of plants to produce and store food, which makes them more susceptible to disease, insects, other pollutants, and harsh weather. Ozone damages the leaves of trees and other plants, ruining the appearance of cities, national parks, and recreation areas. Ozone reduces crop and forest yields and increases plant vulnerability to disease, pests, and harsh weather. This impacts annual crop production throughout the United States, resulting in significant losses, and injures native vegetation and ecosystems. Ozone also damages certain man-made materials, such as textile, fibers, dyes, and paints, requiring more frequent upkeep and repair.[17]

1.4.2 Ozone Precursor – Oxides of Nitrogen (NO_x)

As stated in Section 1.4, VOCs and NO_x are both precursors to the formation of ozone. Ground level ozone is formed when NO_x and VOCs chemically react in the presence of sunlight. Oxides of nitrogen consist of a mixture of gases comprised mostly of nitric oxide (NO) and nitrogen dioxide (NO_2). These gases are emitted from the exhaust of motor vehicles, the burning of coal, oil or natural gas, and during industrial processes such as welding, electroplating and dynamite blasting. Although most NO_x is emitted as NO, it is readily converted to NO_2 in the atmosphere. NO_2 is a reddish-brown, highly

[14]MARAMA. Appendix A: Health Effects of Air Pollutants, A Guide to Mid-Atlantic Regional Air Quality Report. Mid-Atlantic Regional Air Management Association (MARAMA), October 2005, p. 89.
[15] NJDEP. Proposed Reasonably Available Control Technology (RACT) for the 8-Hour Ozone National Ambient Air Quality Standard (NAAQS) and other Associated State Implementation Plan (SIP) Revisions for the Fine Particulate Matter NAAQS, Regional Haze, and the Clean Air Act Requirements on Transport of Air Pollution. New Jersey Department of Environmental Protection, February 2, 2007.
[16] USEPA. Air Quality Criteria for Ozone and Related Photochemical Oxidants, Volume I of III. United States Environmental Protection Agency, February 2006.
[17] USEPA. Ground-level Ozone – Health and Environment. United States Environmental Protection Agency, http://www.epa.gov/air/ozonepollution/health.html. Last updated November 20, 2006.

reactive gas that is formed in the air through the oxidation of NO.[18] In the troposphere, near the Earth's surface, NO_2, not molecular oxygen, provides the primary source of the oxygen atoms required for ozone formation.

In addition to contributing to the formation of ozone, NO_x is also harmful if directly inhaled. Long-term exposure to elevated levels of NO_x causes damage to the mechanisms that protect the human respiratory tract and can increase a person's susceptibility to, and the severity of, respiratory infections and asthma.[19] Long-term exposure to high levels of NO_x can cause chronic lung disease and may also affect sensory perception. Other health effects of exposure to NO_x include shortness of breath and chest pains.

1.4.3 Ozone Precursor – Volatile Organic Compounds (VOC)

Volatile Organic Compounds (VOCs) are chemicals or mixtures of chemicals that evaporate easily at room temperature. The term *organic* in VOCs indicates that the compounds contain carbon and *volatile* indicates that these compounds react more readily in the atmosphere compared to other compounds.[20] They include compounds known as hydrocarbons, which only contain carbon and hydrogen, and carbonyls, which contain a carbon atom double-bonded to an oxygen atom. VOCs can be found in both indoor and outdoor environments. Some VOCs are more harmful than others. Sources of VOCs include vehicle and industrial exhaust; the evaporation of gasoline; and a variety of consumer products from paints, solvents, adhesives to carpeting, deodorants, cosmetics, cooking, hair products, and cleaning fluids; as well as biogenic (naturally occurring) emissions.

In addition to contributing to the formation of ozone, VOCs are harmful if directly inhaled, dependent upon concentration. Long-term exposure to low concentrations of some VOCs include elevation of serum enzyme levels, mild cellular changes, and changes in lipid metabolism. At higher concentrations, breathing VOCs may cause irritation of the respiratory tract.[21] Acute effects include eye irritation/watering, nose irritation, throat irritation, headaches, nausea/vomiting, dizziness and asthma exacerbation. Chronic effects include cancer, liver damage, kidney damage and central nervous system damage.[22] In addition, several VOCs are also hazardous air pollutants

[18] NJDEP. 2005 Nitrogen Dioxide Summary, 2005 Air Quality Monitoring Report. New Jersey Department of Environmental Protection, Bureau of Air Monitoring, 2006.
[19] Queensland Government EPA. Nitrogen Oxides. Queensland Government Environmental Protection Agency, Queensland Parks and Wildlife Service, December 31, 2006, http://www.epa.qld.gov.au/environmental_management/air/air_quality_monitoring/air_pollutants/nitrogen_oxides/, accessed January 2, 2007.
[20] The United States Environmental Protection Agency's regulatory definition of *volatile organic compounds* can be found at 40 C.F.R. 51.100(s).
[21] CDPHE. Volatile Organic Compounds Health Effects Fact Sheet. Colorado Department of Public Health and Environment, November 2000, http://www.cdphe.state.co.us/hm/schlage/vocfactsheet.pdf.
[22] MDH. Volatile Organic Compounds – VOCs Fact Sheet. Minnesota Department of Health., http://www.health.state.mn.us/divs/eh/indoorair/voc/, September 2005.

(HAPs).[23] HAPs are substances that cause serious health effects, including cancer, birth defects, nervous system problems and death due to massive accidental releases.[24]

1.4.4 Ozone Related Benefits from Global Warming Initiatives

New Jersey has aggressively taken the lead in doing its part to combat global warming through innovative policies to reduce its carbon footprint and is aggressively pushing for mandatory federal action to combat global climate change.

On February 13, 2007, Governor John S. Corzine signed an Executive Order to adopt proactive and ambitious goals for the reduction of greenhouse gas emissions in New Jersey. The order calls for reducing greenhouse gas emissions to 1990 levels by 2020, approximately a 20 percent reduction, followed by a further reduction of emissions to 80 percent below 2006 levels by 2050. Greenhouse gases include carbon dioxide (CO_2), methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons and fully fluoridated compounds.[25]

New Jersey is playing a leadership role in the Regional Greenhouse Gas Initiative (RGGI), a ten-state cooperative effort to implement a regional mandatory cap-and-trade program in the Northeast and Mid-Atlantic addressing CO_2 emissions from power plants. The first mandatory market-based program to reduce carbon emissions in the U.S., the program will cap regional power plant CO_2 emissions at approximately current levels from 2009 through 2014 and reduce emissions 10% below the initial cap by 2018. A memorandum of understanding was signed on December 20, 2005, outlining the framework of the program. In August 2006, a model regulation was released outlining in detail the cap-and-trade program. Participating RGGI states, including New Jersey, are currently in the process of proceeding with rulemaking to adopt the model regulation in 2007 and 2008.

Other New Jersey initiatives include standards for new automobiles and light trucks, the implementation of renewable portfolio standards, and an Energy Master Plan. On October 3, 2006, Governor Corzine announced the commencement the year-long interagency planning process that will culminate in the energy master plan, a long-term energy vision for the state that plans for the state's energy needs through 2020.[26] The Energy Master Plan will require 20 percent of the electricity used in the State to come from Class One renewable energy sources by the Year 2020 and will reduce future electricity consumption by 20 percent from projected 2020 consumption levels. The plan

[23] Substances listed in 1990 Clean Air Act Title I, Sec. 112(b)).
[24] USEPA. The Plain English Guide to the Clean Air Act. United States Environmental Protection Agency, Air and Radiation (ANR-443), EPA 400-K-93-001, April 1993.
[25] State of New Jersey Office of the Governor. *Governor Calls for Sweeping Reduction of Greenhouse Gas Emissions in New Jersey*. Available at http://www.nj.gov/governor/news/news/approved/20070213a.html. February 13, 2007.
[26] State of New Jersey Office of the Governor. *Governor Corzine Announces Initial Phase of Energy Master Plan.* Available at http://www.nj.gov/governor/news/news/approved/20061003.html. October 3, 2006.

also calls for the adoption of comprehensive appliance and equipment energy efficiency standards. [27]

These measures will not only reduce greenhouse gas emissions, but will also have supplemental benefits of reducing VOC and NO_x emissions, as well as other air contaminants.

1.5 Summary of this SIP Proposal

The remainder of this proposed SIP revision includes the following:

- A discussion of the nature of the ozone air quality problem in the Northeast
- A summary of the trends in New Jersey's air quality
- A discussion of control measures
- A demonstration of attainment for the year 2010 for both 8-hour nonattainment areas associated with New Jersey
- A Reasonable Further Progress (RFP) analysis
- A Reasonably Available Control Measures (RACM) analysis
- A discussion of contingency measures
- A discussion of the State's obligations in Section 110 of the Clean Air Act
- Transportation and General conformity budgets
- Addressing 1-hour ozone in New Jersey
- Consideration of a new 8-hour ozone health standard
- New Jersey specific declarations and commitments

[27] op. cit., note 25