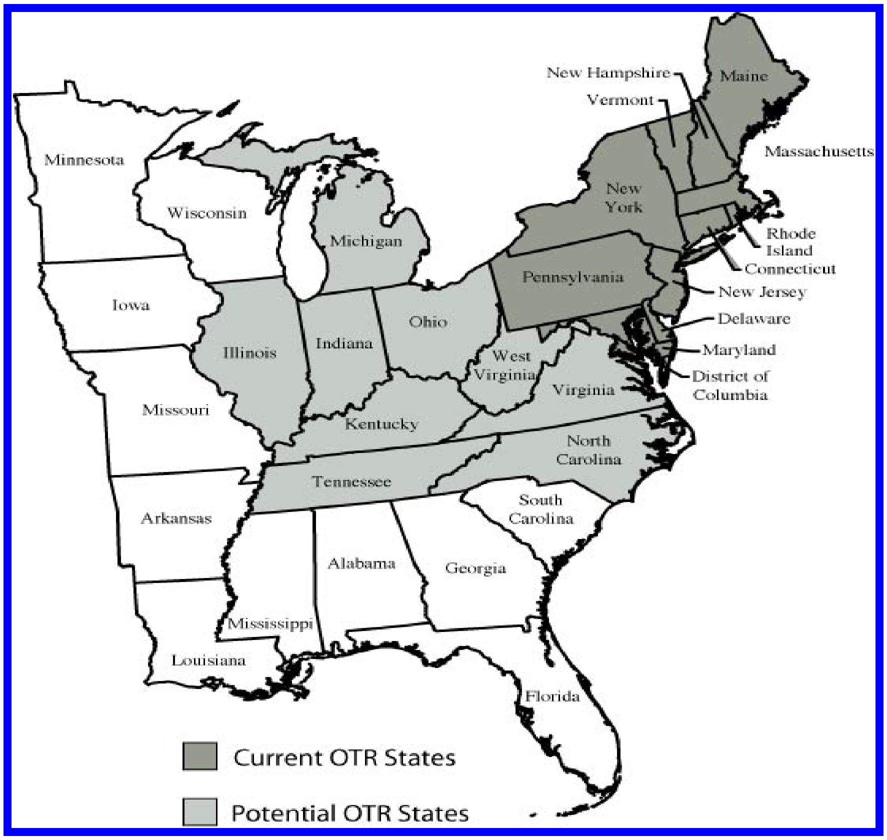
TECHNICAL SUPPORT DOCUMENT
FOR THE PETITION TO THE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FOR THE ADDITION OF
ILLINOIS, INDIANA, KENTUCKY, MICHIGAN, NORTH CAROLINA, OHIO, TENNESSEE, VIRGINIA AND WEST VIRGINIA
TO THE OZONE TRANSPORT REGION



December 10, 2013

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MARYLAND DEPARTMENT OF THE ENVIRONMENT
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OVERVIEW OF THE TECHNICAL SUPPORT DOCUMENT

The purpose of this document is to provide the technical justification for this petition to the United States Environmental Protection Agency (EPA) to expand the current Ozone Transport Region to include the states of Illinois, Indiana, Kentucky, Michigan, North Carolina, Ohio, Tennessee, Virginia and West Virginia. Section 1 provides an introduction to the 8-hour ozone nonattainment problem and the statutory and regulatory background for the petition. Section 2 provides the technical justification and criteria used to identify new states to add to the Ozone Transport Region (OTR). Section 3 includes regional modeling estimating the emission reductions necessary for attainment and supporting the need for expansion of the OTR. Finally, Section 4 provides a summary of the conclusions of the technical analysis. An appendix includes two case studies from the current OTR (New York and Maryland) of pollution controls already being adopted in OTR states. New York and Maryland have adopted extremely aggressive control programs, but still face two of the toughest ozone problems in the Country. Both of these states are overwhelmed by transport.

SECTION 1 – INTRODUCTION AND BACKGROUND

Ground-level ozone, a primary ingredient in smog, is formed when volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) react chemically in the presence of sunlight. Cars, trucks, power plants, and industrial facilities are primary sources of these emissions. Ozone pollution is a concern during the summer months when the weather conditions most conducive to formation of ground-level ozone – sunshine and hot temperatures – normally occur. Complicating the identification of the source emissions for ozone is the fact that the chemical reactions that create ozone can take place while the pollutants are being transported by the wind. This means that elevated levels of ozone can occur many miles away from the source of their original precursor emissions. Therefore, unlike more traditional pollutants, such as sulfur dioxide (SO_2) or lead, that are emitted directly and can be controlled at their source, reducing ozone concentrations poses additional control challenges.

Ground-level ozone can cause lung airways inflammation, which has been compared to the skin inflammation caused by sunburn. Other symptoms from exposure include wheezing, coughing, pain when taking a deep breathe, and breathing difficulties during exercise or outdoors activities. Even at very low levels, exposure to ozone can result in decreased lung function, primarily in children who are active outdoors, as well as increased hospital admissions and emergency room visits for respiratory illnesses among children and adults with pre-existing respiratory diseases like asthma. In addition to these primary symptoms, medical professionals now believe that repeated exposure to ozone pollution for several months can cause permanent lung damage. People with respiratory problems are most vulnerable to the health effects associated with ozone exposure, but even healthy people who are active outdoors can be affected when ozone levels are high.

Ozone also affects sensitive vegetation and ecosystems. In addition to forests, parks, wildlife refuges and wilderness areas, ozone affects many farm crops in Maryland causing lower crop yields. In particular, ozone harms sensitive vegetation, including trees and plants, during the growing season.

Under the Clean Air Act (CAA), EPA has established health- and welfare-based standards for ozone in the air we breathe. Over the years, these standards have become more protective, reflecting the results of improved health science studies. The most recent national ambient air quality standard (NAAQS) for ozone was promulgated on April 5, 2008, and set a level of 0.075 parts per million (ppm) for maximum 8-hour average ozone.[1] Over the years, EPA and states have instituted a variety of emission control programs to reduce ozone precursor emissions (NO_x and VOCs) from vehicles, industrial facilities, and electric utilities. Emission control programs are also aimed at reducing pollution by reformulating fuels and consumer and commercial products, such as paints and chemical solvents that contain VOCs.

Despite significant progress, the ozone pollution start school growing problem experienced in the Northeast and Mid-Atlantic states during the summer months persists and cannot be solved without addressing the long-range transport of ozone and its precursors into this region of the country from upwind states. The phenomenon of ozone transport into the Northeast is not new and has been recognized for over 35 years.[2] Prior to 1990, EPA and states had no appropriate regulatory or legal mechanism to address the transport of ozone and ozone precursors. Finally, in the 1990 Amendments to the CAA, section 176A, Interstate Transport Commissions, allows EPA to establish, by rule, a transport region whenever the Administrator has reason to believe that the interstate transport of pollutants from one or more states contributes significantly to a violation of a NAAQS in one or more other states. In CAA section 184, Congress specifically established the current OTR, which is comprised of the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and the 1980 Consolidated Metropolitan Statistical Area (CMSA) that includes the District of Columbia. CAA section 176A(a)(1) allows the Governor of any state to petition the Administrator of EPA to add any state(s) to a transport region, "whenever the Administrator has reason to believe that interstate transport from such state significantly contributes to a violation of the standard in the transport region …"

STANDARDS FOR GROUND LEVEL OZONE

Sections 108 and 109 of the CAA govern the establishment, review, and revision, as appropriate, of the NAAQS to provide protection for the nation's public health and the environment. The CAA requires periodic review of the science upon which the standards are based and the standards themselves. Reviewing the NAAQS is a lengthy undertaking and includes the following major phases: Planning, Integrated Science Assessment, Risk and Exposure Assessment, and Policy Assessment. Scientific review during the development of these documents is thorough and extensive. The Clean Air Science Advisory Committee reviews

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[1] New York, Maryland and other states are challenging these standards as inefficiently protective under the Clean Air Act. *Mississippi v. EPA*, Case No. 08-1200 (D.C. Cir.).
[2] *e.g.*, Wolff et al., 1977: An investigation of long-range transport of ozone across the midwestern and eastern United States, *Atmos. Environ.*, 11, 797–802.

drafts of all documents and the public has an opportunity to comment on them. Table 1 identifies the ozone standard as it has become more stringent through the years following periodic scientific reviews.

Table 1: Ozone NAAQS from 1971 to Present

Final Rule Decision	Type	Indicator	Averaging Time	Level (ppm)	Form
1971 36 FR 8186 Apr 30, 1971	Primary and Secondary	Total photochemical oxidants	1-hour	0.08	Not to be exceeded more than one hour per year
1979 44 FR 8202 Feb 8, 1979	Primary and Secondary	Ozone	1-hour	0.12	Attainment is defined when the number of days with maximum hourly average concentration greater than 0.12 ppm, over three years divided by three is equal to or less than one
1993 58 FR 13008 Mar 9, 1993	EPA decided that revisions to the standards were not warranted at the time				
1997 62 FR 38856 Jul 18, 1997	Primary and Secondary	Ozone	8-hour	0.08	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
2008 73 FR 16483 Mar 27, 2008	Primary and Secondary	Ozone	8-hour	0.075	Annual fourth-highest daily maximum 8-hour concentration, averaged over three years

EPA'S "NO_x SIP CALL" BUDGET PROGRAM

On November 7, 1997, building on the recommendations of the Ozone Transport Assessment Group (OTAG), EPA proposed to require 22 states and the District of Columbia to submit State Implementation Plans (SIPs) that address the regional transport of ground-level ozone for the 1997 8-hour ozone NAAQS. EPA proposed to set statewide NO_x emissions budgets to eliminate the significant contribution of emissions from upwind states with respect to the 1979 1-hour ozone NAAQS. The primary statutory basis for this action was the "Good Neighbor" provision of section 110(a)(2)(D)(i)(I), under which, in general, each SIP is required to include provisions assuring that sources within the state do not emit pollutants in amounts that significantly contribute to nonattainment or maintenance problems downwind.

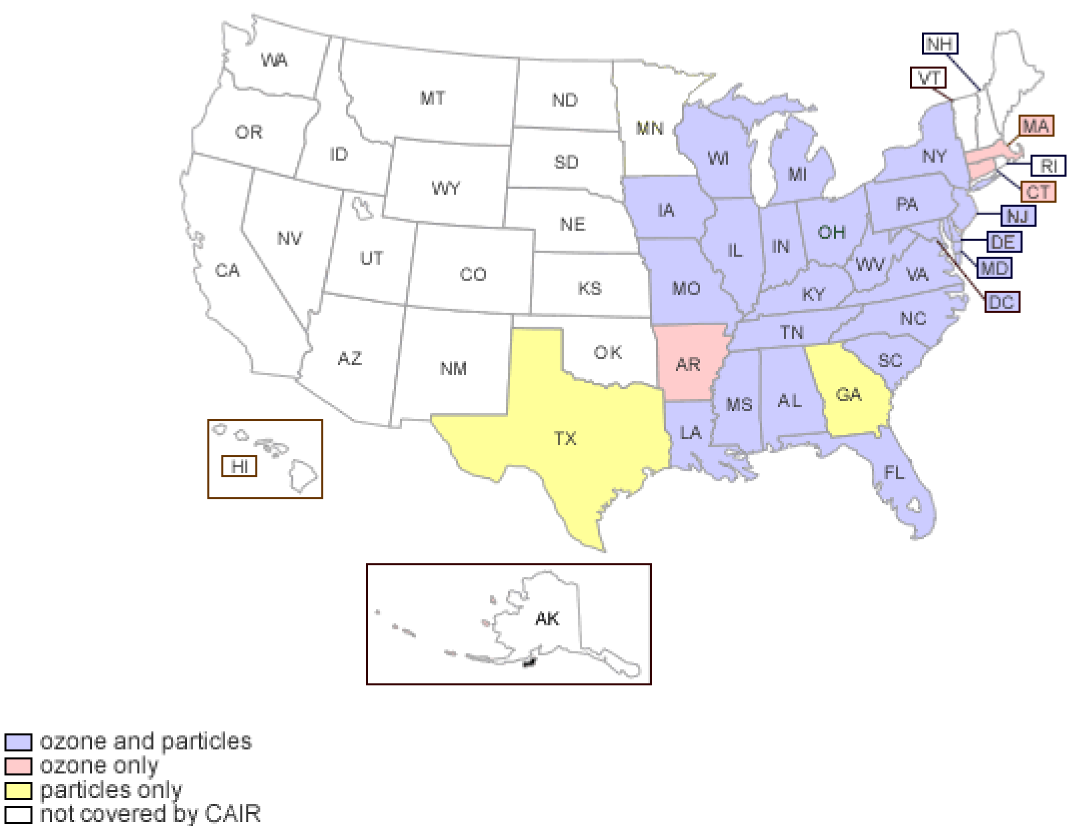
In October 1998, EPA finalized the "Finding of Significant Contribution and Rulemaking for Certain States in the OTAG Region for Purposes of Reducing Regional Transport of Ozone." This federal program was heavily modeled after the OTR 1999 to 2003 NO_x Budget Program that included the 12 OTR member states and the District of Columbia. Generally speaking, if a state met its statewide NO_x emissions budget, EPA would consider it to have met the "Good Neighbor" statutory requirements of CAA section 110(a)(2)(D)(i)(I) for the 1997 ozone NAAQS.

FEDERAL CLEAN AIR INTERSTATE RULE

On March 10, 2005, EPA replaced the NO_x SIP Call with the Clean Air Interstate Rule (CAIR). CAIR built on the NO_x SIP Call and defined upwind states' "Good Neighbor" obligations with respect to the 1997 ozone NAAQS and the 1997 NAAQS for annual levels of $PM_{2.5}$ ($PM_{2.5}$ consists of very small particles, smaller than 2.5 micrometers in diameter). As the result of litigation, the United States Court of Appeals for the District of Columbia Circuit (Court) found certain elements of CAIR to violate the CAA and remanded CAIR back to EPA, but the Court left CAIR in place until it was replaced "with a rule consistent with" the opinion of the Court.

CAIR was intended to provide states with a solution to the problem of power plant pollution that drifts from one state to another. It covers 27 eastern states and the District of Columbia, as indicated in Figure 1.

Figure 1: States Covered by the CAIR



CAIR uses a cap and trade system to reduce the target pollutants—SO_2 and NO_x—by 70 percent and 60 percent, respectively, compared to 2003 annual power plant emission levels. States must achieve the required emission reductions using one of two compliance options: (1) meet the state's emission budget by requiring power plants to participate in an EPA-administered interstate cap and trade system that caps emissions in two stages, or (2) meet an individual state emissions budget through measures of the state's choosing.

Despite the reductions required by CAIR, EPA's technical modeling predicted that 69 monitors in the OTR will still be in nonattainment of the 2008 Ozone NAAQS of 0.075 ppm in 2015. Table 2 lists these monitors by CMSA or Metropolitan Statistical Area (MSA), county, and state, and contributions in parts per billion (ppb).

Table 2: Modeled Nonattainment Areas in the OTR in 2015[3]

CMSA/MSA	State	County	2015 Base (ppb)	2015 CAIR (ppb)	Benefits of CAIR in 2015 (ppb)
Hartford, CT	CT	Hartford	77.4	76.8	-0.6
Hartford, CT	CT	Middlesex	89.1	88.4	-0.7
New Haven-Meriden, CT	CT	Fairfield	91.4	90.6	-0.8
New Haven-Meriden, CT	CT	New Haven	89.8	89.1	-0.7
New London-Norwich, CT	CT	New London	81.8	81.1	-0.7
Hartford, CT	CT	Tolland	79.7	79.1	-0.6
Dover, DE	DE	Kent	76.6	75.5	-1.1
Philadelphia, PA	DE	New Castle	82.8	81.5	-1.3
	DE	Sussex	78.4	77.3	-1.1
Washington-Baltimore, DC-MD	DC	Washington	83.5	82.7	-0.8
	ME	Hancock	77.2	76.8	-0.4
	ME	York	78.0	77.6	-0.4
Washington-Baltimore, DC-MD	MD	Anne Arundel	86.0	84.9	-1.1
Washington-Baltimore, DC-MD	MD	Baltimore	81.9	81.0	-0.9
Washington-Baltimore, DC-MD	MD	Carroll	77.8	76.3	-1.5
Philadelphia, PA-DE-NJ	MD	Cecil	86.9	85.4	-1.5
Washington-Baltimore, DC-MD	MD	Charles	76.5	75.6	-0.9
Washington-Baltimore, DC-MD	MD	Harford	90.6	89.6	-1.0
	MD	Kent	83.4	82.3	-1.1
Washington-Baltimore, DC-MD	MD	Montgomery	77.4	76.4	-1.0
Washington-Baltimore, DC-MD	MD	Prince Georges	81.9	80.9	-1.0
Barnstable-Yarmouth, MA	MA	Barnstable	80.8	80.2	-0.6
Boston, MA-NH	MA	Bristol	80.3	80.0	-0.3
Boston, MA-NH	MA	Essex	80.6	80.2	-0.4
Springfield, MA	MA	Hampden	77.3	76.7	-0.6

[3] Source: Appendix E, Table E-1, Technical Support Document for the Final Clean Air Interstate Rule, Air Quality Modeling, March 2005, http://www.epa.gov/cair/technical.html

Boston, MA-NH	MA	Middlesex	76.1	75.8	-0.3
Philadelphia, PA-DE-NJ	NJ	Atlantic	78.5	77.7	-0.8
New York City, NY-NJ-CT	NJ	Bergen	85.7	84.5	-1.2
Philadelphia, PA-DE-NJ	NJ	Camden	89.5	88.3	-1.2
Philadelphia, PA-DE-NJ	NJ	Cumberland	82.2	80.9	-1.3
Philadelphia, PA-DE-NJ	NJ	Gloucester	89.6	88.2	-1.4
New York City, NY-NJ-CT	NJ	Hudson	83.3	82.4	-0.9
New York City, NY-NJ-CT	NJ	Hunterdon	86.5	85.4	-1.1
New York City, NY-NJ-CT	NJ	Mercer	93.5	92.4	-1.1
New York City, NY-NJ-CT	NJ	Middlesex	89.8	88.8	-1.0
New York City, NY-NJ-CT	NJ	Monmouth	83.9	83.2	-0.7
New York City, NY-NJ-CT	NJ	Morris	83.4	81.8	-1.6
New York City, NY-NJ-CT	NJ	Ocean	98.0	96.9	-1.1
New York City, NY-NJ-CT	NJ	Passaic	78.5	77.4	-1.1
New York City, NY-NJ-CT	NY	Bronx	80.8	79.5	-1.3
Jamestown, NY	NY	Chautauqua	79.9	78.6	-1.3
New York City, NY-NJ-CT	NY	Dutchess	78.9	78.1	-0.8
Buffalo, NY	NY	Erie	85.2	84.2	-1.0
	NY	Essex	76.2	75.6	-0.6
	NY	Jefferson	78.7	78.0	-0.7
Buffalo, NY	NY	Niagara	80.8	80.3	-0.5
New York City, NY-NJ-CT	NY	Putnam	80.4	79.3	-1.1
New York City, NY-NJ-CT	NY	Queens	76.7	76.0	-0.7
New York City, NY-NJ-CT	NY	Richmond	84.6	83.9	-0.7
New York City, NY-NJ-CT	NY	Suffolk	89.9	89.0	-0.9
New York City, NY-NJ-CT	NY	Westchester	84.2	83.1	-1.1
Pittsburgh, PA	PA	Allegheny	80.4	78.9	-1.5
	PA	Armstrong	78.0	76.1	-1.9
Pittsburgh, PA	PA	Beaver	77.9	76.8	-1.1
Reading, PA	PA	Berks	79.4	76.9	-2.5
Philadelphia, PA-DE-NJ	PA	Bucks	93.0	91.8	-1.2
Philadelphia, PA-DE-NJ	PA	Chester	83.7	82.2	-1.5
Harrisburg, PA	PA	Dauphin	78.6	76.0	-2.6
Philadelphia, PA-DE-NJ	PA	Delaware	82.4	81.0	-1.4
Erie, PA	PA	Erie	77.1	76.0	-1.1
	PA	Franklin	78.0	75.5	-2.5
Lancaster, PA	PA	Lancaster	81.3	78.4	-2.9
Allentown, PA	PA	Lehigh	80.1	78.3	-1.8
Philadelphia, PA-DE-NJ	PA	Montgomery	86.5	84.9	-1.6
Allentown, PA	PA	Northampton	79.8	78.1	-1.7
Philadelphia, PA-DE-NJ	PA	Philadelphia	88.9	87.5	-1.4
Providence, RI	RI	Kent	83.9	83.2	-0.7
Providence, RI	RI	Providence	78.6	78.1	-0.5
Providence, RI	RI	Washington	81.8	81.3	-0.5

Furthermore, EPA's technical modeling indicated that ozone transport would constitute a sizable portion of projected nonattainment in most eastern areas in 2010 (even after implementation of the NO_x SIP call and other controls). In many cases, over 50 percent of the ozone nonattainment problem is due to emissions in other states. Future nonattainment areas were projected to have at least a 26 percent overall contribution from transported ozone or ozone precursors. EPA's modeling results for transport contributions to select OTR nonattainment counties are in Table 3.

Table 3: Percent Contribution to Ozone Nonattainment Due to Transport from Upwind States[4]

2010 Base Nonattainment Counties	2010 Base 8-Hour Ozone (ppb)	Percent of 8-Hour Ozone due to Transport
New Haven CT	91	95%
Middlesex CT	90	93%
Kent RI	86	88%
Ocean NJ	100	82%
Fairfield CT	92	80%
Monmouth NJ	86	65%
Morris NJ	86	63%
Gloucester NJ	91	62%
Middlesex NJ	92	62%
Camden NJ	91	57%
Westchester NY	85	56%
Richmond NY	87	55%
Philadelphia PA	90	55%
Suffolk NY	91	52%
Kent MD	86	47%
Montgomery PA	88	47%
Anne Arundel MD	88	45%
Chester PA	85	39%
Washington DC	85	38%
Bergen NJ	86	38%
Newcastle DE	85	37%
Erie NY	87	37%
Mercer NJ	95	36%
Cecil MD	89	35%
Bucks PA	94	35%
Harford MD	93	31%
Hunterdon NJ	89	26%

[4] Source: Table VI-2, Page 31, Technical Support Document for the Final Clean Air Interstate Rule, Air Quality Modeling, March 2005, http://www.epa.gov/cair/technical.html

The Comprehensive Air Quality Model with Extensions (CAMx) source apportionment determined the maximum 8-hour ozone contributions in ppb from upwind states to downwind states. Monitors from eight current Ozone Transport Region states were included as receptors. The maximum contributions to each state are listed in Table 4. Non-OTR states are denoted with an asterisk (*).

Table 4: CAIR Highest Maximum 8-Hr Ozone Contributions from Upwind to Downwind State[5]

Ozone (ppb)	Current OTR Downwind States							
Upwind States	CT	DE	DC	MD	NJ	NY	PA	RI
AL*	0	0	0	0	1	0	0	0
AR*	0	1	1	1	1	1	1	0
CT	-	0	0	0	1	26	1	15
DE	4	-	1	4	18	6	22	3
FL*	0	0	0	1	1	1	1	0
GA*	0	0	0	1	1	1	1	0
IL*	3	4	4	4	4	3	3	2
IN*	3	3	3	3	3	3	4	2
IA*	1	2	1	2	2	2	2	1
KY*	3	4	3	4	3	3	5	2
LA*	0	1	1	1	0	0	1	0
ME	1	0	0	0	0	1	0	1
MD	9	44	49	-	35	15	39	5
MA	8	1	0	1	0	7	1	27
MI*	3	5	2	5	6	5	6	3
MN*	0	0	0	1	0	1	1	0
MO*	1	2	3	3	2	2	2	1
NH	1	0	0	0	0	1	0	3
NJ	23	3	1	1	-	52	27	18
NY	31	2	1	2	17	-	3	29
NC*	3	6	0	9	5	6	4	3
OH*	10	9	10	11	9	10	9	9
PA	25	17	6	25	47	34	-	22
RI	2	0	0	0	0	2	0	-
SC*	0	1	0	1	1	1	0	0
TN*	0	1	1	1	1	0	0	0
VA*	7	9	7	18	10	11	13	6
WV*	3	6	2	6	5	3	5	3
WI*	1	1	0	3	2	5	2	1

[5] Source: Appendix G, Technical Support Document for the Final Clean Air Interstate Rule, Air Quality Modeling, March 2005, http://www.epa.gov/cair/technical.html

FEDERAL CROSS-STATE AIR POLLUTION RULE

On August 8, 2011, EPA promulgated a final rule entitled, "Federal Implementation Plans: Interstate Transport of Fine Particulate Matter and Ozone and Correction of SIP Approvals" (76 FR 48208). The 2011 Cross-State Air Pollution Rule (CSAPR) was EPA's attempt to develop a rule consistent with the court's opinion in the CAIR litigation. CSAPR addresses the "Good Neighbor" obligations of upwind states with respect to three NAAQS: the 1997 8-hour ozone NAAQS, and the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. New York, Maryland, and other states joined EPA in defending CSAPR.

On August 21, 2012, the Court vacated CSAPR and ordered EPA to continue implementing CAIR until a suitable replacement is promulgated. However, CAIR failed to adequately address transport for the 1997 ozone NAAQS and has resulted in continued nonattainment in many areas. On October 5, 2012, the U.S. Department of Justice, on behalf of EPA, filed a petition in the D.C. Court of Appeals seeking a rehearing *en banc* of the court's decision vacating CSAPR. New York, Maryland, and other states filed a similar petition with the court. The court denied these petitions on January 24, 2013.[6]

FEDERAL 2008 OZONE NAAQS IMPLEMENTATION RULE

On April 30, 2012, EPA issued two final rules that direct key aspects of the implementation of the 2008 NAAQS for ground-level ozone. In "Air Quality Designations for the 2008 Ozone National Ambient Air Quality Standards" (77 FR 30088), EPA established initial air quality designations and classifications for most areas in the country. In EPA's second final rule, entitled "Implementation of the 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation Conformity Purposes" (77 FR 30160), EPA set thresholds for classifications for the 2008 ozone standard.

Many states have taken action to avoid nonattainment requirements (*i.e.*, seeking attainment designations for the 2008 NAAQS when 2011 and/or 2012 monitoring data indicates nonattainment) instead of taking action to reduce pollution. Because of their historic attainment status, these states have not yet adopted even the most basic control strategies such as major source NO_x Reasonably Available Control Technology (RACT). In addition, some upwind states have applied for and been granted NO_x waivers from EPA for their nonattainment areas. NO_x waivers allow areas to continue to have large significant sources of NO_x emissions uncontrolled, despite significant contributions to nonattainment areas in downwind states.

In addition, the most recent monitored air quality data used to calculate design values (DVs) indicates that the ozone nonattainment problem is more acute and widespread than indicated by the recent designations under the 2008 ozone NAAQS. Table 5 identifies nonattainment areas in upwind non-OTR states identified in the petition that have been classified as marginal

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[6] *EME Homer City Generation, L.P. v. EPA*, 2013 U.S. App. LEXIS 1623 (D.C. Cir. Jan. 24, 2013) and *EME Homer City Generation, L.P. v. EPA*, 2013 U.S. App. LEXIS 1624 (D.C. Cir. Jan. 24, 2013).

nonattainment of the 2008 ozone NAAQS. Design values above the 2008 8-hour ozone NAAQS are shown in red.

Table 5: Non-OTR Upwind Nonattainment Areas with Marginal Classifications For the 2008 Ozone NAAQS

Area Classified Marginal Nonattainment of the 2008 Ozone NAAQS	2010 DV (ppb)	2015 Extrapolated DV from 2010 (ppb)	2012 Preliminary DV (ppb)	2015 Extrapolated DV from 2012 (ppb)[7]
Charlotte-Rock Hill, NC-SC	82	74.8	82	74.8
Chicago-Naperville, IL-IN-WI	74	71.0	80	77.0
Cincinnati, OH-KY-IN	79	73.9	84	78.9
Cleveland-Akron-Lorain, OH	77	72.1	82	77.1
Columbus, OH	77	71.3	82	76.3
Knoxville, TN	77	69.9	79	71.9
Memphis, TN-MS-AR	76	69.8	79	72.8
St. Louis-St. Charles-Farmington, MO-IL	77	71.9	79	73.9

OTR member states are required to implement certain control measures statewide as if they were classified as "moderate" nonattainment. EPA has designated all areas in Table 5 above as "marginal" nonattainment even though their own technical analysis shows that not all of these areas will come into attainment through reductions from measures already in place. Since SIP requirements and attainment deadlines vary based on nonattainment designation, areas that EPA expects to remain nonattainment past 2015 are inappropriately classified and will not be required to prepare plans demonstrating how they will attain the standard in the most expeditious manner practicable.

A reanalysis using EPA's linear extrapolation method starting with preliminary 2012 design values shows that four of the areas listed in Table 5 above are likely to continue to be in nonattainment in 2015. The 2015 EPA-extrapolated DVs shown above are no longer valid since CSAPR was vacated in August 2012 and are likely much higher, putting the remaining areas in jeopardy of being nonattainment of the 2008 ozone NAAQS in 2015. As a result, the premises in the rulemakings used to justify the thresholds (77 FR 30160) and the area designations (77 FR 30088) are also no longer valid.

Furthermore, as shown in Table 6, five non-OTR states identified in the petition have 2011 certified design values that violate the 2008 ozone NAAQS, even though they are designated as being in attainment based on 2010 DVs. In addition, 2012 preliminary design value data from the non-OTR states identified in the petition show 16 areas violate the 2008 ozone NAAQS despite EPA's attainment designation based on 2010 DVs. According to the U.S. Census Bureau, in

[7] Linear extrapolation from EPA's 2015 DV based on 2012 preliminary design values.

2010, nearly 21 million people lived in these metropolitan areas that are designated as attainment of the standards but experience ozone at levels that violate the NAAQS.

Table 6: Areas Designated Attainment for the 2008 Ozone NAAQS that have 2011 and/or 2012 Design Values Greater than 75 ppb

Core-Based Statistical Area	2009-2011 Design Value (ppb)	2010-2012 Preliminary Design Value (ppb)
Allegan, MI	78	78
Bloomington, IN	-	77
Canton-Massillon, OH	-	79
Chattanooga, TN-GA	-	76
Dayton, OH		76
Detroit-Warren-Livonia, MI	78	78
Louisville/Jefferson County, KY-IN	78	85
Morristown, TN	-	78
Muskegon-Norton Shores, MI	76	76
Nashville-Davidson-Murfreesboro-Franklin, TN	-	78
Owensboro, KY	-	79
Salisbury, NC	-	78
Sevierville, TN	-	76
Springfield, OH	-	76
Wilmington, OH	76	81
Youngstown-Warren-Boardman, OH-PA	-	78

Table 6 above clearly shows the ozone nonattainment problem and the ozone transport problem are more pervasive and severe than current nonattainment statuses indicate. Without immediate action by EPA to expand the OTR to include the nine significantly contributing states identified in the petition, attainment of the 2008 ozone NAAQS in many areas throughout the eastern United States will remain elusive. Since EPA has indicated that it does not plan to redesignate these areas as nonattainment, expansion of the OTR is warranted so that the states can work together to address transport.

SECTION 2 – TECHNICAL JUSTIFICATION AND CRITERIA USED TO IDENTIFY NEW STATES TO ADD TO THE OZONE TRANSPORT REGION

The 2011 Cross-State Air Pollution Rule refers to the emissions that must be prohibited pursuant to CAA section 110(a)(2)(D)(i)(I) because they *significantly contribute* to nonattainment or interfere with maintenance of the NAAQS in another state. As part of EPA's significant contribution analysis, EPA quantified air quality contributions of upwind states to specific downwind monitors using CAMx source apportionment techniques. The upwind states that contributed at least one percent of the NAAQS to a downwind monitor were "linked" to the air quality in that area as significant contributors. Conversely, those states whose contributions were below the one percent threshold were determined not to significantly contribute to nonattainment or interfere with maintenance. While the D.C. Circuit Court's decision in *EME Homer City v. EPA*, 696 F.3d 7 (D.C. Cir. 2012), ultimately vacated CSAPR, petitioners did not oppose this particular methodology and the Court relied on the one-percent threshold for section 110(a)(2)(D)(i)(I) in its opinion.

The air quality modeling performed to support the CSAPR forms the basis for this petition to expand the OTR. The results of EPA's CAMx source apportionment modeling for the final CSAPR are publicly available.[8] The data used here is derived from 2012 base case ppb contributions to 8-hour ozone from each source state to each monitoring site.

Since CSAPR modeling analysis was based on the outdated 1997 8-hour ozone NAAQS, the analysis presented in this section considers the 2008 ozone NAAQS of 75 ppb. Therefore, in this analysis, an upwind state that contributes one percent of the NAAQS or 0.75 ppb or greater to a downwind state is considered a "significant contributor." Only monitors in counties officially designated nonattainment for the 2008 8-hour ozone NAAQS in EPA Regions 1, 2 and 3 are considered in the significant contribution analysis.[9] Interference with maintenance of the 8-hour ozone NAAQS, while part of the definition of significant contribution, is not considered. If included, it would only strengthen the evidence in favor of expansion of the OTR.

Table 7 summarizes the key information used by the petitioners to choose states for membership in an expanded OTR. It includes information on each upwind state's significant contributions to states within the current OTR with designated ozone nonattainment areas:

- the number of states to which it contributes;
- its highest out-of-state contribution; and
- the number of monitors affected, including those classified as "Moderate" and those which a state has requested to be reclassified as "Moderate" or above.

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[8] EPA, "Contributions of 8-hour ozone, annual $PM_{2.5}$, and 24-hour $PM_{2.5}$ from each state to each monitoring site" (2010), available from http://www.epa.gov/airtransport/CSAPR/techinfo.html, Docket ID: EPA-HQ-OAR-2009-0491-4228.

[9] EPA, Designated 8-Hour Ozone Nonattainment Sites (2012), available from: http://www.epa.gov/airquality/ozonepollution/designations/2008standards/state.htm.

It includes data for all significant contributors whether or not the state is named in the petition, including current members of the OTR.

Table 7: 8-Hour Ozone Significant Contribution Analysis

Upwind States	OTR States to which this State makes a Significant Contribution	Greatest Out-of-State Contribution in OTR (ppb)	OTR Nonattainment Monitors Affected by a Significant Contribution from the Upwind State		
			OTR[10]	Balt, MD[11]	NY portion of NYMA[12]
Non-OTR	Named in petition		(83 total)	(6 total)	(9 total)
IL	CT, DE, DC, MD, NJ, NY, PA	4.8	48	2	5
IN	CT, DE, DC, MD, NJ, NY, PA	6.8	67	5	5
KY	CT, DE, DC, MD, NJ, NY, PA	3.6	62	4	4
MI	CT, DE, DC, MD, MA, NJ, NY, PA	7.7	54	5	6
NC	CT, MD, NJ, NY, PA	1.9	26	4	3
OH	CT, DE, DC, MD, MA, NJ, NY, PA	14.4	82	6	9
TN	CT, DE, DC, MD, NJ, NY, PA	2.3	34	1	1
VA	CT, DE, DC, MD, MA, NJ, NY, PA	15.8	80	6	9
WV	CT, DE, DC, MD, NJ, NY, PA	6.7	78	6	9
Non-OTR	Not named in petition				
AL	NY	0.9	1	0	0
AR	CT	0.8	1	0	0
GA	NY	1.0	1	0	0
IA	NY	0.8	1	0	0
MO	CT, NJ, NY, PA	1.2	19	0	1
WI	NY, NJ	1.1	5	0	0
OTR					
CT	CT, DE, MA, NJ, NY	6.3	20	0	4
DE	CT, DE, NJ, NY, PA	5.8	27	0	3
MD/DC	CT, DE, DC, MA, MD, NJ, NY, PA	24.0	79	6	9
MA	CT, MA, NJ, NY	1.5	8	0	2
NJ	CT, DE, DC, MD, MA, NJ, NY, PA	19.5	60	1	9
NY	CT, DE, DC, MD, MA, NJ, NY, PA	20.6	64	5	9
PA	CT, DE, DC, MD, MA, NJ, NY, PA	21.3	83	6	9
RI	MA	0.9	1	0	0

[10] Virginia monitors are excluded.
[11] Classified as "Moderate."
[12] Classified as "Marginal" but New York has requested a bump-up to "Moderate."

Maine, New Hampshire, and Vermont are the only current OTR members not included as upwind states in Table 7 above. For Maine and New Hampshire, both made contributions over 0.75 ppb to monitors in Massachusetts and, for New Hampshire, to monitors in Maine but these sites were not designated nonattainment. For Vermont, the modeled impact of its emissions was less than 0.75 ppb at every monitoring site (within or outside of the OTR) in the final CSAPR contribution modeling. OTR states like New Hampshire, Rhode Island, Maine, and Vermont are not included as downwind states because they do not have designated nonattainment areas for 8-hour ozone at this time.*

Since interference with maintenance of the NAAQS is a co-equal concern in CAA section 110(a)(2)(D)(i)(I), it is important to note that the states named in the petition as a group contribute over 0.75 ppb to *all* the OTR monitors (127) that were modeled for CSAPR. This includes the monitors from New Hampshire, Rhode Island, and Maine. A Vermont receptor site, while not include in the final CSAPR modeling, was included in an earlier EPA contribution assessment of the Proposed Transport Rule.[13] The non-OTR states of IN, OH, NC, VA and WV each had contributions of greater than 0.75 ppb at the Bennington, VT receptor. The modeled contributions to Vermont from these five states ozone totaled 10 ppb, which is 80 times larger than the (0.12 ppb) modeled contribution of Vermont emissions to its own monitor.

If EPA concludes that at least a one-percent contribution to a current OTR nonattainment area is a sufficient criterion for membership in an expanded OTR, the result would include Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Kentucky, Michigan, Missouri, North Carolina, Ohio, Tennessee, Virginia, West Virginia, and Wisconsin, as shown in Figure 2.

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*Note, however, that Rhode Island is currently monitoring ozone concentrations that exceed the 8-hour ozone standard and that eight of the nine states named in the petition contribute 0.75 ppb or more to Rhode Island's levels.

[13] EPA, "Contribution Data Calculated from the Transport Rule Proposal Source Apportionment modeling for 8-Hour Ozone, annual $PM_{2.5}$, and 24-Hour $PM_{2.5}$" (2010), available from: http://www.epa.gov/airtransport/pdfs/2012O3PMContributions_AllSites.xls.

Figure 2: New Ozone Transport Region Based on One-Percent Significant Contributors

However, to identify the top regional contributors for an expanded OTR, the petitioners suggest applying secondary criteria in addition to the one-percent threshold. To focus on those states that, if added, would strengthen the current regional planning processes of the OTR, we believe the following additional criteria should be used.

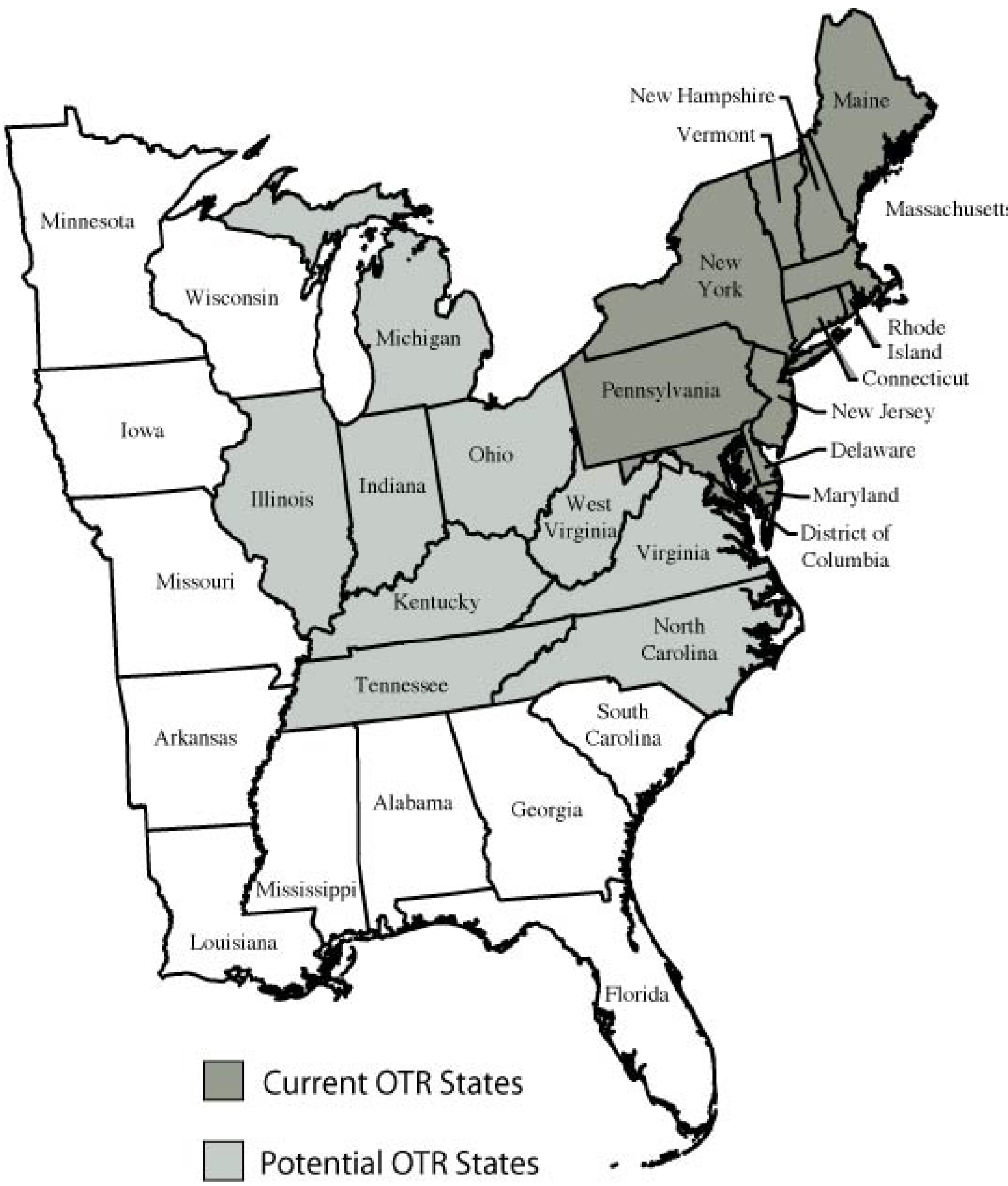
New members should contribute over one percent of the 8-hour ozone NAAQS:

- to designated nonattainment areas in at least five current OTR states;
- at 25 (30 percent) or more monitors in designated nonattainment areas in current OTR states; and

- to designated nonattainment areas or portions of designated nonattainment areas classified as “Moderate” (Baltimore, MD) or which have requested a bump-up to “Moderate” (New York portion of NYMA) in current OTR states.

Based on these criteria, this petition asks EPA to add Illinois, Indiana, Kentucky, Michigan, North Carolina, Ohio, Tennessee, Virginia, and West Virginia to the current OTR, as shown in Figure 3.

Figure 3: New Ozone Transport Region as Requested by Petitioners



As shown in Table 7 (p. 13), the states that would be added to the OTR contribute more to 8-hour ozone levels than some of the *current members* of the OTR. All of the proposed members:

- Significantly contribute to more nonattainment monitors in current OTR states than Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont;
- Affect more nonattainment OTR monitors than Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; and
- Affect more “Moderate” monitors or monitors with pending requests to be reclassified as “Moderate” than Delaware, Massachusetts, New Hampshire, Rhode Island, and Vermont.

In addition, each state named in the petition makes a higher maximum significant contribution to nonattainment monitors than Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

As shown by the CSAPR modeling, nonattainment of the 2008 ozone NAAQS is significantly influenced by emissions from a larger region than for the previous, less stringent NAAQS. Therefore, achieving ozone attainment requires an expansion of the Ozone Transport Region.

SECTION 3 – SUPPLEMENTAL MODELING TO SUPPORT THE NEED TO EXPAND THE OZONE TRANSPORT REGION

The New York State Department of Environmental Conservation (NYSDEC), Maryland Department of The Environment (MDE) and other OTR state agencies conducted preliminary screening modeling for the Ozone Transport Commission (OTC) Modeling Committee using the Community Multiscale Air Quality (CMAQ) model and the California Photochemical Grid Model (CALGRID). NYDEC leads this effort. Scenarios were specifically designed to inform states whether additional measures, beyond what is already on the books, might be needed to meet attainment dates. EPA participates in the OTC Modeling Committee as well.

"Scenario 4" was modeled using CMAQ with an OTR and non-OTR average NO_x reduction of 58 percent and an OTR and non-OTR average VOC reduction of 30 percent from 2007 base levels. In addition to "Scenario 4", two sensitivity runs were performed by taking an across-the-board NO_x reduction/increase of 10 percent from "Scenario 4" NO_x levels. These two sensitivity runs are called N48V30 (NOx 48 percent and VOC 30 percent reduction) and N68V30 (NOx 68 percent and VOC 30 percent reduction). Modeling results for monitors in the current OTR states with the highest 2020 design values are shown in Table 8. DVs above the 2008 8-hour ozone NAAQS are shown in red.

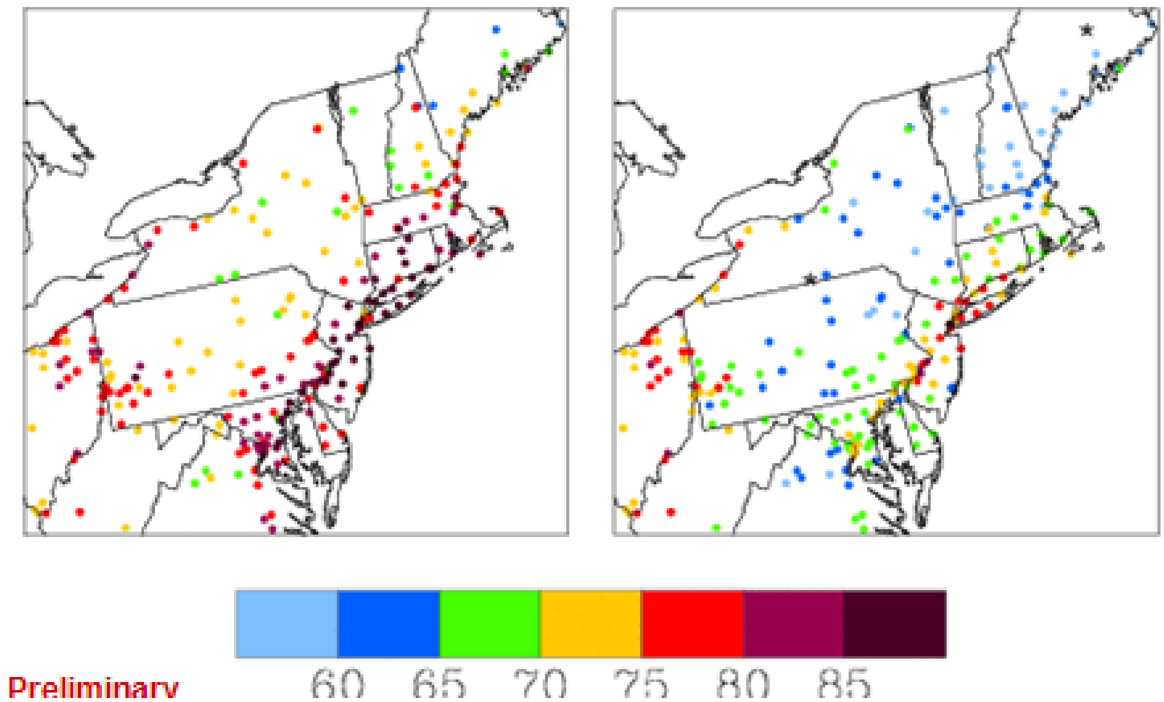
Table 8: 2020 Ozone Design Values from OTC Level 2 Screening Modeling

Monitor		2007 DV (ppb)	2020 DV N48/V30 (ppb)	2020 DV Scenario 4 (N58/V30) (ppb)	2020 DV N68/V30 (ppb)
Bayonne	NJ	85	82	80	76
White Plains	NY	86	77	73	69
Camden	NJ	88	77	73	67
Bristol	PA	90	77	72	66
Greenwich	CT	86	76	72	66
Babylon	NY	88	75	71	65
NEA	PA	88	75	70	64
NYC-Queens	NY	86	74	72	71
Clarksboro	NJ	86	74	69	63
Edgewood	MD	91	71	66	57
Chicopee	MA	88	70	65	58

Even with the maximum levels of reductions modeled, the ozone monitor in Bayonne, NJ, which is part of New York Metropolitan Area (NYMA), is still predicted to exceed the nonattainment threshold in 2020 with a DV of 76 ppb.

"Scenario 6"[14] was modeled using CMAQ with a 58 percent reduction of on-road NO_x emissions and a 43 percent reduction of electric generating unit (EGU) NO_x emissions in the OTR only (relative to 2007 emission levels). This was considered a Year 2018 "On-The-Way" scenario. Results are shown in Figure 4. They support the "Scenario 4" conclusion that NO_x reductions on the order of 68 percent are needed from both inside and outside of the current OTR in order for NYMA to attain the 2008 ozone NAAQS.

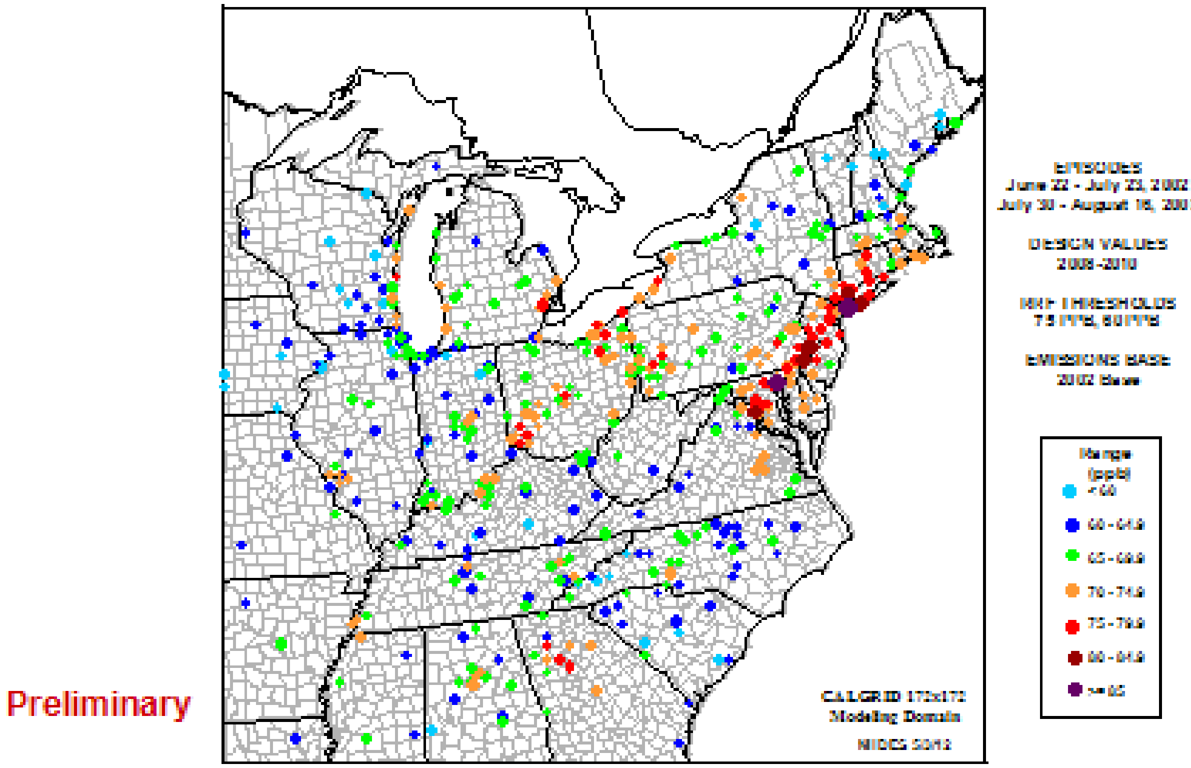
Figure 4: CMAQ 2007 Base Case and 2018 "Scenario 6" Ozone Design Values (ppb)



"Scenario 6" modeling using CALGRID was expanded to include non-OTR states. CALGRID modeled a 51 percent reduction of on-road NO_x emissions and a 31 percent reduction in OTR EGU emissions and a 47 percent reduction in non-OTR EGU emissions in 2018 (relative to 2007 emission levels). Results are shown in Figure 5. They support the "Scenario 4" conclusion that NO_x reductions on the order of 68 percent are needed from both inside and outside the current OTR in order for NYMA to attain the 2008 ozone NAAQS.

14 "Scenario 5" modeled the Year 2015.

Figure 5: CALGRID 2018 "Scenario 6" Ozone Design Values (ppb)



Petitioners predict that it will take from six to 10 years to implement the measures necessary to realize NO_x emission reductions on the order of 68 percent from 2007 levels throughout the eastern United States. This includes between three and five years to identify, develop and adopt stationary source programs for all large NO_x sources and another three to five years for sources to implement these controls and realize emission reductions. If any single OTC state were to proceed alone, it would not be possible to reduce emissions enough to meet or stay below the ozone NAAQS. The reduction of upwind emissions is critical to achieve and maintain clean air in the petitioning states.

Granting this petition to expand the OTR will help the petitioning states achieve the needed emission reductions and provide a forum for developing regional solutions to the regional ozone problem.

SECTION 4 - CONCLUSIONS

States in the eastern United States face a pervasive 8-hour ozone nonattainment problem. The current OTR states have adopted and implemented numerous and increasingly stringent controls on sources of VOCs and NO_x that upwind states have not. EPA's own modeling establishes that that interstate transport of air pollution over a larger region contributes significantly to violations of the ozone NAAQS in the current OTR.

Efforts by EPA to control transport have been thwarted and delayed. The court remand of CSAPR in the *Homer* decision underscores the urgent need to expand the OTR. Even though CAIR is still in effect, it only addresses the 1997 ozone NAAQS, so it will not address the identified significant contributing upwind states that prevent current OTR members from complying with the 2008 ozone NAAQS. While a lengthy appeals process continues, the CAA deadlines for ozone compliance loom for current OTR members.

The petitioners have an obligation to provide their citizens with healthy air quality, but they cannot do this on their own. Petitioners need to work in concert with EPA and all of the states that contribute significantly to the ozone nonattainment problem. The CAA established the OTR as a forum for such cooperation in 1991 under section 184 of the CAA. The petitioner now asks EPA to expand the OTR so it can more completely deal with the transport of ozone and to assist all nonattainment areas in providing air quality that is protective of public health.

The provisions of CAA section 176A allow for the Governor of a state to petition the EPA Administrator to add states to an existing transport region if the interstate transport of air pollution from one or more states contributes significantly to a violation of the standard in one or more states in the transport region. It is clear from this technical analysis that the identified non-OTR states significantly contribute to nonattainment in the current OTR. As such, this petition has met the statutory requirement for expanding the OTR to include these states:

- Illinois
- Indiana
- Kentucky
- Michigan
- North Carolina
- Ohio
- Tennessee
- Virginia
- West Virginia

APPENDIX: TWO CASE STUDIES OF CONTROL MEASURES IN OTR STATES: NEW YORK AND MARYLAND

All petitioners have made extensive efforts within their state and as part of the current OTR to reduce NOx and VOC emissions to reduce ozone levels since the passage of the CAA amendments in 1990. Rather than listing these efforts state by state, we have chosen to focus on two states - New York and Maryland - which our modeling and data analyses show have two of the most intractable ozone problems in the country. These case studies provide an overview of the types of measures adopted throughout the current OTR prior to the filing of this petition to expand the OTR.

NEW YORK

New York State Implementation Plan for Ozone: 1994

As a result of the CAA Amendments of 1990, EPA was required to initially designate whether, as of 1989, areas within their jurisdictions were either in attainment or not in attainment (nonattainment) with the NAAQS (CAA section 107). The ozone NAAQS that was in place in 1994 was commonly referred to as the 1-hour ozone NAAQS, and was set at 0.12 ppm, not to be exceeded more than once per year over a three year period. In New York, the Albany-Schenectady-Troy Area, the Buffalo-Niagara Falls Area, the Essex County Area (Whiteface Mountain above 4,500 feet in elevation), the Jefferson County Area and the Poughkeepsie Area were designated nonattainment for ozone with a marginal classification. The New York-Northern New Jersey-Long Island, NY-NJ-CT Area was designated nonattainment for ozone with a Severe-17 classification (56 FR 56805).

The CAA Amendments of 1990 require all nonattainment areas classified pursuant to CAA section 181 as serious, severe, and extreme to submit to EPA a State Implementation Plan demonstrating how the area will attain the health based standards for ozone by a prescribed date. In September 1994, EPA issued policies addressing both submittal of the 1994 attainment demonstrations and attainment dates for ozone nonattainment areas that were substantially affected by the long-range transport of ozone or ozone precursors. New York submitted its SIP by the November 15, 1994 statutory deadline.

The November 15, 1994 SIP incorporated the following control programs: New Motor Vehicle Emission Control program, Enhanced Inspection and Maintenance (I/M) of Motor Vehicle Emission Systems, Federal Reformulated Gasoline - Phase II, Federally Required Control Measures, NO_x RACT, VOC RACT and Employee Commute Options Program/Transportation Control Measures (TCMs). It also committed to future control programs such as: Phase II/III NO_x in conjunction with the OTC Memorandum of Understanding (MOU) on NO_x, Enhancements to Consumer Solvents Requirements, Enhancements to Architectural Coatings Requirements, Clean Fuel Fleets for Heavy Duty Vehicles, New York City Natural Gas Medallion Taxi Cab Pilot program, I/M for Heavy Duty Diesel/Gasoline Vehicles and Federal Non-Road Hardware and Fuel.

Despite the implementation of all the mandatory control requirements for a severe nonattainment area and other additional controls, the 1994 SIP clearly demonstrates that the New York metropolitan nonattainment area for ozone is substantially affected by the transport of ozone and ozone precursors into the region. The SIP states that "this transport makes it impossible to attain in this area since no combination of control measures, including a complete shutdown of all emissions in the region, would result in projected attainment. New York cannot be made responsible for the air that enters into its jurisdiction. It must rely on EPA to ensure that air quality that enters the New York region is sufficiently below the standard so as to allow New York a reasonable opportunity to adequately attain and maintain the standard for ozone". The 1994 SIP includes a substantial amount of modeling which serves to document the fact that air entering the New York region was well above the 1-hour NAAQS for ozone.
In 1994, New York requested that,

> "EPA undertake a review of all SIPs in areas upwind of New York under section 110(a)(2)(d) of The Act as amended in 1990. EPA's review must verify whether or not upwind plans include adequate provisions to prohibit the emission of air pollutants in amounts that will contribute significantly to our nonattainment with the standard for ozone. This review should not be limited to the OTR. New York also requests that EPA review SIPs in areas outside the OTR. EPA's regional modeling analyses of the impact of sources outside the OTR shows significant improvement in air quality (15 to 18 ppb) when controls are required outside the OTR."

New York State Implementation Plan for Ozone: 2008

On July 18, 1997, EPA promulgated a more stringent ozone standard of 0.08 ppm, measured over an 8-hour period (62 FR 38856). In general, the 1997 8-hour standard is more protective of public health and more stringent than the 1979 1-hour standard. After being delayed by litigation, on April 30, 2004, EPA designated the NYMA, comprised of the New York State counties of Suffolk, Nassau, Kings, Queens, Richmond, New York, Bronx, Westchester and Rockland, as well as counties in the states of Connecticut and New Jersey, as nonattainment (moderate classification) for the 8-hour ozone NAAQS, effective June 15, 2004 (69 FR 23858). In addition, Jamestown, NY; Buffalo-Niagara Falls, NY; Rochester, NY; Jefferson Co, NY; Essex Co, NY (Whiteface Mountain) ; Albany- Schenectady-Troy, NY and Poughkeepsie, NY were designated as nonattainment with the 1997 ozone NAAQS.

The February 8, 2008 SIP for the 1997 ozone NAAQS identified the ongoing mobile source and stationary source control measures that have been enacted to minimize emissions of NO_x and VOCs. They include Fuel Consumption and Use – Gasoline, Gasoline Dispensing Sites and Transport Vehicles, Federal Reformulated Gasoline – Phase I and II, Motor Vehicle Emissions, Emission Standards for Motor Vehicles and Motor Vehicle Engines, New Source Review in Nonattainment Areas and Ozone Transport Region, VOC RACT, General Process Emission Sources, Solvent Metal Cleaning Processes, Surface Coating Processes including Autobody Shops), Petroleum and Volatile Organic Liquid Storage and Transfer, Pharmaceutical and Cosmetic Manufacturing Processes, Graphic Arts, Maximum Achievable Control Technology (MACT), Consumer Products, Architectural and Industrial Maintenance (AIM) Coatings, Landfill Gas Collection and Control Systems for Certain Municipal Solid Waste Landfills, NO_x

RACT for Stationary Combustion Installations, NO_x RACT for General Process Sources, and the NO_x Budget Trading Program.

New mobile and stationary source control measures included in the SIP include: Low Emission Vehicles (LEV), Personal Watercraft, NYMA I/M Programs (NYVIP and NYTEST), Federal Diesel Fuel (with state Backstop), Federal Non-Highway Diesel Fuel and Heavy Duty Diesel On-Road Requirements, Surface Coating Processes; Consumer Products, Portable Fuel Containers, Graphic Arts, Asphalt Formulation, NO_x Emissions Budget Ozone Season Trading Program; NO_x Emissions Budget Annual Trading Program, SO_2 Emissions Budget Annual Trading Program, Portland Cement Plants, Glass Manufacturing, Asphalt Paving Production, NO_x RACT for Major Sources and NO_x RACT for Minor Sources.

On September 17, 2007, New York submitted a SIP revision that satisfies New York's 110(a)(2)(D)(i) obligations to submit a SIP revision that contains adequate provisions to prohibit air emissions from adversely affecting another state's air quality through interstate transport. EPA finalized approval (73 FR 4109) of this SIP revision on January 24, 2008.

OTC NO_x MOU

On September 24, 1994, all OTC member states other than Virginia signed the OTC NO_x MOU regarding the control of regional NO_x emissions from large stationary sources. The signatory states, including the state of New York, committed to the development and proposal of regulations that mandated region-wide ozone season NO_x emissions reductions. Specifically, the emission reduction requirements applied to stationary sources characterized as fossil fuel fired boilers and indirect heat exchangers with a maximum rated heat input capacity of at least 250 MMBtu/hour. In the aggregate, NO_x emissions were to be reduced from these sources by approximately 70 percent from 1990 levels.

New York Pre-2003 Nitrogen Oxides Emissions Budget and Allowance Program

Under the OTC NO_x MOU, NO_x emissions reductions were to be accomplished by the establishment of a region-wide emissions cap and trade program. The OTC NO_x MOU called for the region-wide reductions to be achieved in three phases. The "Phase 1" reductions were achieved by the imposition of RACT on these sources. New York imposed RACT by promulgating 6 NYCRR Subpart 227-2, which became effective in February 1994. The cap-and-trade program consisted of two phases.

The first phase spanned the 1999 -2002 ozone seasons - known as the "Phase 2" reductions. The second phase spanned the ozone seasons from 2003 onward - known as the "Phase 3" reductions. New York implemented the NO_x cap-and-trade program by promulgating 6 NYCRR Subpart 227-3, "Pre-2003 Nitrogen Oxides Emissions Budget and Allowance Program."6 NYCRR Subpart 227-3 implemented the Phase 2 reductions by creating the New York component of the region-wide program. The Phase 2 budgets were calculated using known or estimated 1990 emissions as the baseline emissions inventory and then applying to each relevant NO_x emissions source an emissions limit depending on the geographic location of the source. 6 NYCRR 227-3 established the state NO_x Budget which represented the New York cap on emissions for the Phase 2 period. The state NO_x Budget was set at 46,959 tons for each ozone season.

New York NO_x Budget Program

In order to comply with the federal NO_x SIP call, 6 NYCRR Part 204, "NO_x Budget Trading Program", established a New York State Trading Program Budget which set a statewide ozone season cap of 41,350 tons on ozone season NO_x emissions beginning in 2003 from the same large stationary sources subject to Subpart 227-3, which sunset in 2002. Part 204 contained methodologies to annually calculate and allocate allowances to accounts set up for each NO_x Budget unit in New York and set-aside accounts for distributions to new units, sponsors of energy efficiency measures, projects generating electricity from renewable resources, and in-plant efficiency improvements. Part 204 also satisfied the Phase III requirement of the OTC NO_x MOU.

New York Acid Deposition Reduction Program

New York adopted 6 NYCRR Part 237, "Acid Deposition Reduction NO_x Budget Trading Program" and 6 NYCRR Part 238, "Acid Deposition Reduction SO_2 Budget Trading Program" In 2004. These programs were designed to reduce acid deposition in New York by limiting emissions of NO_x during the non-ozone season and SO_2 year-round from fossil fuel fired electricity-generating units.

New York CAIR Impacts

In 2007, New York adopted three emissions cap-and-trade rules in response to the federal CAIR. Part 243 established the CAIR NO_x Ozone Season Trading Program that replaced Part 204; Part 244 established the CAIR NO_x Annual Trading Program that replaced Part 237; and Part 245 established the CAIR SO_2 Trading Program that replaced Part 238. The Phase 1 CAIR NO_x Ozone Season Trading Program budget for the 2009 through 2014 control periods is 31,091 tons for each control period. The Phase 2 CAIR NO_x Ozone Season Trading Program budget for the control period of 2015 and beyond is 27,652 tons for each control period.

Despite the reductions required by CAIR, EPA's technical modeling undertaken in 2005 predicted that four areas in New York would exceed 0.075 ppm in 2015, which is nonattainment for the 2008 Ozone NAAQS.

New York 2008 Ozone NAAQS Implementation Rule Impacts

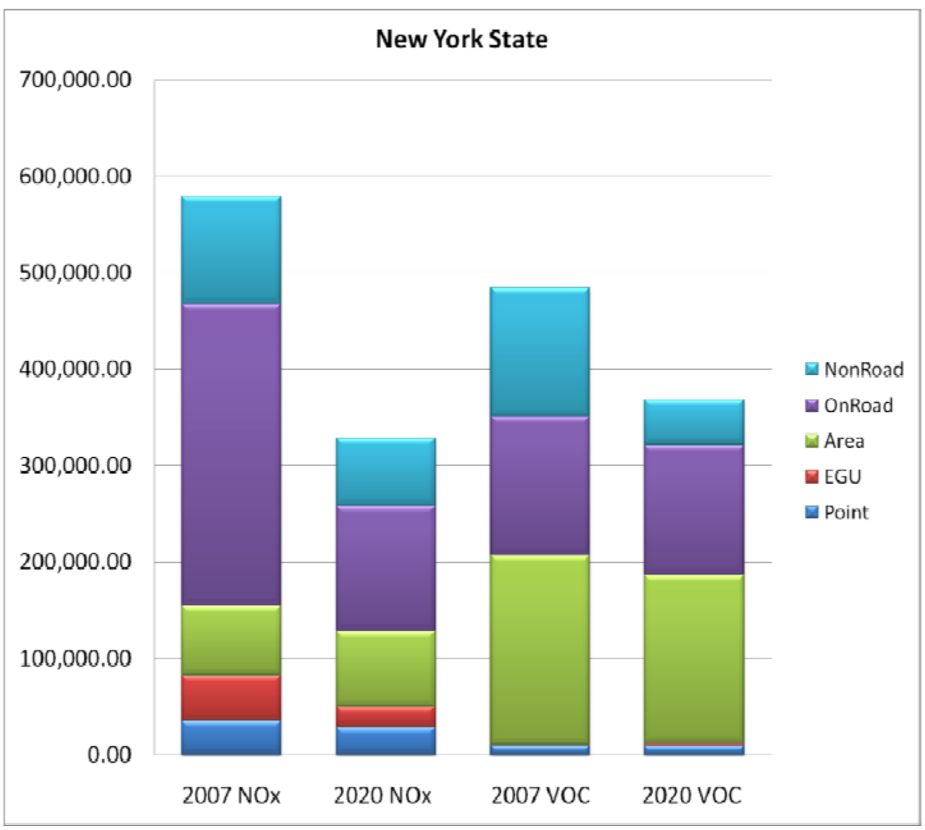
EPA designated NYMA and Jamestown, NY as "marginal" ozone nonattainment areas for the 2008 ozone NAAQS. On June 20, 2012, in accordance with the CAA and sections 181(a)(4) and 181(b)(3), New York requested the Administrator reclassify the NYMA as "moderate" ozone nonattainment because modeling predicted nonattainment beyond the official December 31, 2015 attainment date that resulted from the marginal classification.

New York, as a result of CAA requirements, has already adopted an amended NO_x RACT control program that requires more control starting in 2014 than any other state program in the East (with the possible exception of New Jersey) and is equivalent to Best Achievable Control Technology (BACT) in many cases. New York set a statewide average electric generating unit (EGU) emissions rate of 0.08 lbs NO_x/ mmBtu annually and during the summer. New York established the strictest motor vehicle program allowed by law, which includes a statewide I/M program. New York has adopted California VOC controls for paint and consumer products. New York now requires the use of ultra low sulfur No. 2 heating oil (15 ppm sulfur) which will also lower NO_x emissions, and rules for heavy oil that are being revised to lower sulfur content limits. Also, New York City is in the process of phasing out heavy oil use.

New York 2007 and Projected Emissions Inventories

Recent preliminary inventory work developed by NYSDEC shows that New York will achieve a 46.6 percent reduction in NO_x emissions from an already highly controlled 579,471 tons in 2007 to 328,457 tons in 2020. Furthermore, New York will achieve a 20.8 percent reduction in VOC emissions from 484,440 tons in 2007 to 368,784 tons in 2020. The 2007 emissions are grown and then controlled based on existing programs (e.g., NO_x RACT, LEV2 and federal non-road measures). As can be clearly seen in Figure A-1, New York is set to obtain a significant overall decrease in emissions from 2007 to 2020. In contrast, many non-OTR states have not instituted the most basic control programs that would result in significant emission reductions. Without EPA action to require emission reductions, including granting this petition to expand the OTR, emission reductions from the non-OTR states cannot be expected.

Figure A-1: NO_x and VOC Emission Projections[15]



[15] Source: NYDEC Division of Air Resources

From an actual ozone season NO_x emission rate perspective, New York had the fifth lowest EGU NO_x emission rate of all eastern states in 2011 as illustrated in Table A-1. Non-OTR states are designated with an asterisk(*). The actual ozone season NO_x emissions for states most immediately upwind of New York, specifically Indiana, Ohio, Kentucky, Michigan and Illinois, are significantly greater. For example, despite a much lower population, Indiana's actual 2011 NO_x emissions were over 4 times greater than New York's emissions in 2011.

Table A-1: Actual Ozone Season Electric Generating Units Emissions and Emission Rates[16]
(2011 Actual NO_x Emissions Sorted From Highest to Lowest)

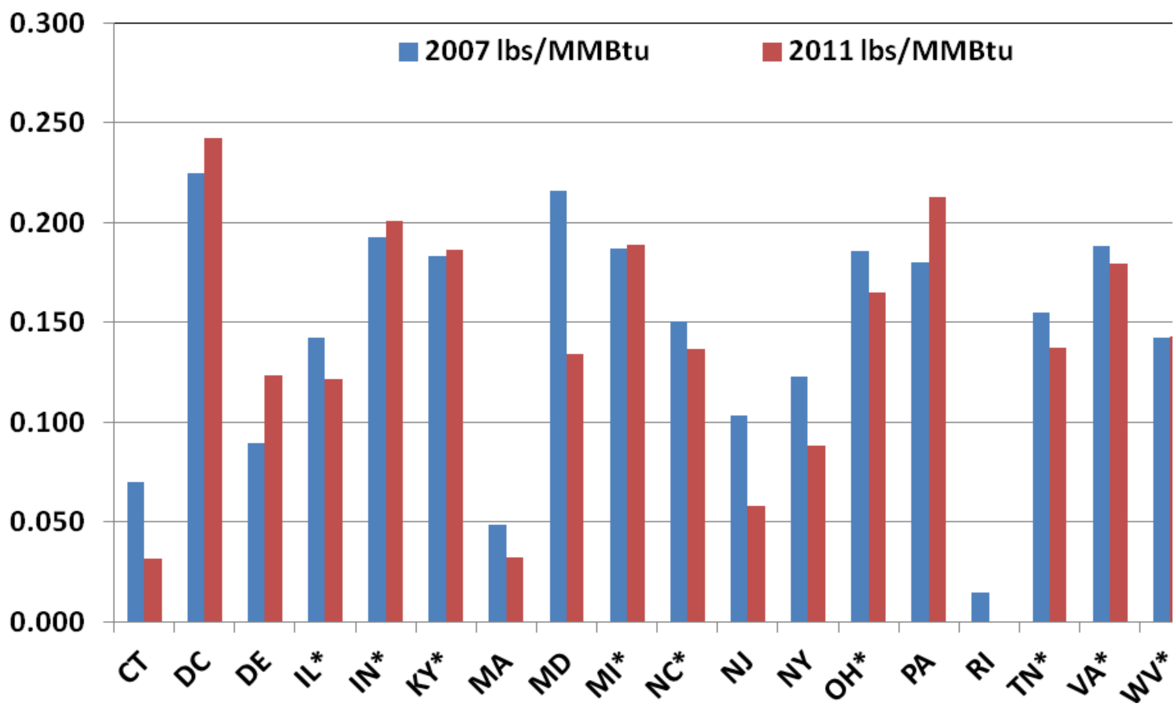
State	2007 Actual NO_x Emissions (tons)	2011 Actual NO_x Emissions (tons)	Change in Emissions from 2007 to 2011 (percent)	2007 Actual NO_x Emission Rate (lbs/ MMBtu)	2011 Actual NO_x Emission Rate (lbs/ MMBtu)	Change in Emission Rate from 2007 to 2011 (%)
PA	57,615	65,933	14	0.180	0.213	18
IN*	56,204	54,816	-2	0.193	0.201	4
OH*	57,862	45,147	-22	0.186	0.165	-11
KY*	40,210	40,089	0	0.183	0.186	2
MI*	34,354	32,941	-4	0.187	0.189	1
IL*	35,283	27,504	-22	0.142	0.122	-14
WV*	28,967	25,189	-13	0.142	0.143	0
NC*	28,390	24,062	-15	0.150	0.137	-9
VA*	22,957	17,494	-24	0.188	0.179	-5
TN*	23,261	16,657	-28	0.155	0.138	-11
NY	**20,986**	**12,399**	**-41**	**0.123**	**0.088**	**-29**
MD	15,538	8,201	-47	0.216	0.134	-38
NJ	7,773	3,556	-54	0.103	0.058	-44
DE	5,454	1,982	-64	0.089	0.123	38
MA	3,666	1,760	-52	0.048	0.032	-33
CT	2,153	854	-60	0.070	0.031	-55
DC	139	201	45	0.225	0.243	8
RI	187	N/A	N/A	0.015	N/A	N/A

As shown in Figure A-2, New York and most of the other OTC states continue to make progress towards reducing emissions that form ozone and contribute to nonattainment but the same cannot be said of many of the upwind states that contribute significantly to nonattainment in the OTR. Many of these states continue to emit far above their CAIR budgets and without any additional

[16] Source: EPA Clean Air Markets Division

impetus will continue to do so for the foreseeable future. Non-OTR states are designated with an asterisk (*).

Figure A-2: Change in NOx Emission Rates from 2007 to 2011 by State



Comparison of Electricity Generating Units Emissions Data

Table A-2 shows the difference between the actual annual EGU emission rate in 2012 and the CAIR 2015 annual emission rate. In 2012, states highlighted in red are emitting at a rate above the 2015 CAIR emission rate, while states highlighted in green are already below the 2015 CAIR emission rate. In 2012, New York had an annual NO_x emission rate that was 43 percent below the 2015 CAIR emission rate. In contrast, Indiana, Kentucky and Michigan are currently emitting at a rate at least 14 percent greater than the 2015 rate. This represents a significant reduction that is still needed in order to meet 2015 CAIR rates. Non-OTR states are designated with an asterisk(*).

Table A-2: Percent Difference between Actual 2012 Annual EGU NOx Emission Rate and CAIR 2015 Emission Rate

State	2012 Actual Annual Emission Rate (lbs/mmBtu)	2015 CAIR Emission Rate (lbs/mmBtu)	Difference in Actual Annual Emission Rate between 2012 and 2015 (lbs/mmBtu)	Difference in Actual Annual Emission Rate between 2012 and 2015 (%)
DC	0.274	0.086	0.188	219
PA	0.205	0.129	0.076	59
IN*	0.176	0.144	0.032	22
KY*	0.173	0.148	0.025	17
MI*	0.158	0.138	0.020	14
OH*	0.145	0.133	0.012	9
DE	0.061	0.057	0.004	7
WV*	0.141	0.133	0.008	6
MD	0.136	0.134	0.002	2
VA*	0.130	0.129	0.001	1
NC*	0.134	0.142	-0.008	-5
IL*	0.106	0.124	-0.018	-15
TN*	0.111	0.140	-0.029	-21
NY	**0.054**	**0.094**	**-0.040**	**-43**
NJ	0.039	0.073	-0.034	-47

Table A-3 shows that while many non-OTR states identified in the petition had actual ozone season EGU emission rates improve from 2011 to 2012, all 9 non-OTR states identified in the petition have 2012 actual ozone season emission rates from 20 percent to 120 percent greater than New York. Non-OTR states are designated with an asterisk(*).

Table A-3: Percent Change in Actual Ozone Season EGU Emissions from 2011 to 2012

State	2011 Actual Ozone Season Emission Rate (lbs/mmBtu)	2012 Actual Ozone Season Emission Rate (lbs/mmBtu)	Change in Actual Ozone Season Emission Rate from 2011 to 2012 (lbs/mmBtu)	Change in Actual Ozone Season Emission Rate from 2011 to 2012 (%)
DC	0.243	0.274	0.031	11
PA	0.213	0.223	0.010	4
KY*	0.186	0.174	-0.012	-7
IN*	0.201	0.171	-0.030	-18
OH*	0.165	0.154	-0.011	-7
WV*	0.143	0.149	0.006	4
MI*	0.189	0.147	-0.042	-28
NC*	0.137	0.142	0.005	4
VA*	0.179	0.133	-0.046	-34
TN*	0.138	0.122	-0.016	-13
MD	0.134	0.117	-0.017	-15
IL*	0.122	0.097	-0.025	-25
NY	**0.088**	**0.078**	**-0.010**	**-13**
DE	0.123	0.065	-0.058	-88
NJ	0.058	0.042	-0.016	-37
MA	0.032	0.035	0.003	8
CT	0.031	0.021	-0.010	-47

New York 2012 Monitoring Data

Despite the emission reductions being achieved in New York and other OTC states, 2012 monitoring data in New York demonstrates a trend of increasing design values from 2010 to 2012 at the air quality monitors in the NYMA and Jamestown nonattainment areas. Table A-4 highlights design values for 2012 that exceed the 2008 ozone NAAQS of 75 ppb. Design values over the 2008 8-hour ozone NAAQS are shown in red.

Table A-4: 8-hour Ozone Design Values for 2012

Station	County	4th Max 2010	4th Max 2011	4th Max 2012	2012 DV
NYSDEC REGION 1		(ppb)	(ppb)	(ppb)	(ppb)
Babylon	Suffolk	85	89	83	85
Riverhead	Suffolk	75	80	83	79
Holtsville	Suffolk	80	82	79	80
NYSDEC REGION 2					
Pfizer Lab	Bronx	75	79	76	76
Susan Wagner	Richmond	85	87	78	83
Queens College 2	Queens	76	84	82	80
CCNY	New York	72	80	76	76
NYSDEC REGION 3					
White Plains	Westchester	75	76	79	76
Rockland County	Rockland	76	74	79	76
Valley Central	Orange	75	67	65	69
Millbrook	Dutchess	76	72	75	74
Mt. Ninham	Putnam	77	68	69	71
Belleayre	Ulster	69	71	67	69
NYSDEC REGION 4					
Loudonville	Albany	73	65	73	70
Grafton Lakes	Rensselaer	73	61	69	67
NYSDEC REGION 5					
Stillwater	Saratoga	71	66	68	68
Whiteface Summit	Essex	73	64	82	73
Whiteface Base	Essex	72	64	71	69
Piseco Lake	Hamilton	68	64	70	67
NYSDEC REGION 6					
Perch River	Jefferson	77	69	77	74
Camden	Oneida	63	60	69	64
Nick's Lake	Herkimer	65	58	65	62
NYSDEC REGION 7					
Fulton	Oswego	71	67	73	70
East Syracuse	Onondaga	73	69	74	72
NYSDEC REGION 8					
Elmira	Chemung	66	65	71	67
Rochester 2	Monroe	72	66	75	71
Williamson	Wayne	71	58	72	67
Pinnacle SP	Steuben	68	67	66	67
NYSDEC REGION 9					
Westfield	Chautauqua	75	73	81	76
Amherst	Erie	72	68	79	73
Middleport	Niagara	71	73	82	75
Dunkirk	Chautauqua	80	69	81	76

MARYLAND

Maryland State Implementation Plan for Ozone: 1994

Under the CAA Amendments of 1990, areas that were previously nonattainment for ozone were required to be designated nonattainment by operation of law. Additionally, these amendments expanded nonattainment areas that were part of an MSA or CMSA. The EPA, during these initial designations, made decisions regarding the extent of these expansions and whether these expansions encompassed entire MSAs or CMSAs for each nonattainment area. These expansions were an early step at addressing transport and growth issues. Nonattainment was measured against the 1-hour ozone NAAQS. In Maryland, the 1980 Washington-Baltimore, DC-MD-VA-WV CMSA was broken into the Baltimore Nonattainment Area which retained the same boundaries as it had before the Amendments and was classified as Severe-15 nonattainment. The Washington Nonattainment Area added three additional counties in Maryland to the nonattainment area as well as several in Virginia, and was classified as "Serious." Cecil County in Maryland, previously attainment, was added to the Philadelphia CMSA Nonattainment Area, also classified as Severe-15. Two additional counties in Maryland, Kent and Queen Anne's Counties, also previously attainment, were designated a separate nonattainment area and classified as marginal.[17]

As a result of the Amendments, areas designated as nonattainment doubled in Maryland subjecting many more rural parts of the state to the very onerous requirements of a severe classification. The Washington Nonattainment Area originally classified as serious was eventually reclassified to severe nonattainment. EPA issued policies addressing both submittal of the 1994 attainment demonstrations and attainment dates for ozone nonattainment areas that were substantially affected by the long-range transport of ozone or ozone precursors. In 1999, the EPA attempted to approve the Washington Nonattainment Area SIP despite the fact the area continued to monitor nonattainment of the 1 hour standard. The EPA reasoned the area would have attained the standard but for transported pollution. Litigation by environmental groups over the approval resulted in the court-ordered reclassification of the Washington Nonattainment Area to severe. The court decision indicates an area suffering continued nonattainment due to transport is accountable for nonattainment regardless of the origin of the pollution. The area will be forced to adopt more rigorous and costly control programs if transported pollution is not abated even though these controls will not result in attainment.

The Attainment SIPs for the 1-hour ozone standard for the Baltimore and Washington Nonattainment Areas incorporated the following control programs: Tier 1 Motor Vehicle Emission Control Program, Enhanced I/M of Motor Vehicle Emission Systems, Federal Reformulated Gasoline - Phase II, NO_x RACT, VOC RACT, Stage II Vapor Recovery, Open Burning Ban, and TCMs. These controls were also required in the marginal nonattainment areas of the state due to the requirements of the Ozone Transport Region. Maryland also committed to future control programs such as: Phase II/III NO_x in conjunction with the OTC MOU on NO_x, Enhancements to Consumer Solvents Requirements, Enhancements to Architectural Coatings

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[17] 56 FR 56773, November 6, 1991, in 56 FR 56694, "Air Quality Designations and Classifications," Final Rule

Requirements, Enhancements to Surface Cleaning/Degreasing Requirements, Enhancements to Auto Refinishing Requirements, Performance Standards for Landfills, and Clean Fuel Fleets for Heavy Duty Vehicles.

The prevailing theory in the early 1980's was that long-range transport was not a significant source of ground-level ozone. Transport that was short range, mostly from large metropolitan area to large metropolitan area, played a more important role. This theory formed the basis for creating the Northeast Ozone Transport Region. During the OTAG deliberations from 1995 to 1997, scientific evidence came to light that long-range transport had a similar if not larger affect on ozone levels in the east than city-to-city transport. EPA promulgated the NO_x SIP Call, the first long-range transport rule, as a result of these findings. Maryland had already begun a comprehensive research program which included empirical data that supported the need for the NOx SIP Call to reduce long-range transport of ozone into the ozone transport region.

Our 20-year ozone research program shows clearly that the number one contributor to Maryland's high ozone level is an elevated reservoir of high transported ozone that forms and collects in the middle of the night. This elevated reservoir is trapped at about 2000 feet above the earth's surface by a nocturnal inversion and can be pushed by elevated nighttime winds for hundreds of miles in a single night. Maryland has hard, measured (not modeled) data, from airplanes, balloons, mountaintop monitors, wind profilers and other measuring equipment that confirm the above conclusions. Our monitors show that as the nocturnal inversion begins to break down, the aloft ozone, routinely measured at levels above 75 ppb, slowly mixes down to earth. The elevated reservoir is created by emissions from nearby, upwind states.

We also have empirical evidence of emissions transported by the nocturnal low-level jet (NLLJ). This is a strong southwest wind along eastern side of the Appalachian Mountains that runs very close to the ground. It begins at sundown and can last until dawn. It can start as far south as North Carolina and can reach as far north as New Jersey, Connecticut, and Massachusetts. Given an average speed of 30 mph, a NLLJ that runs for seven hours carries gases and particulate matter 210 miles. Data collected simultaneously from wind profilers and ozonesondes has revealed that ozone is transported via the nocturnal low-level jet. Lidar data reveals similar transport for particulate matter.

This air quality data is more difficult to obtain and evaluate but does lend proof upwind areas influence air quality in downwind areas and should be adopting controls to reduce transported pollution. Controlling transported pollution is very important in attaining the ozone NAAQS to downwind states such as Maryland.

Maryland State Implementation Plan for Ozone: 2007

Transport becomes central to attainment in more and more states with every lowering of the NAAQS. The success of regional NO_x controls in reducing ozone in Maryland is well documented. The implementation of significant local controls from 1997 to 2003 in Maryland was able to reduce ozone by about 1 ppb/year. Under the NO_x SIP Call, 75% of the EGU controls were put in place from 2003 to 2007. From 2003 to 2008, Maryland ozone was reduced by 2 ppb/year — double the rate under local controls alone.

With every decrease in the NAAQS, the proportion of the NAAQS represented by transported pollution in these states increases. Meteorologists and atmospheric chemistry researchers at Howard University, the University of Maryland, and other institutions have documented the impact that meteorology and air transport processes such as the nocturnal low level jet (NLLJ) and the elevated ozone reservoir have on local emissions levels.

On July 18, 1997, EPA promulgated a more stringent ozone standard of 0.08 ppm, measured over an 8-hour period (62 FR 38856). On April 30, 2004, EPA designated the Baltimore and Washington Nonattainment Areas as moderate nonattainment areas for the 8-hour ozone NAAQS, effective June 15, 2004 (69 FR 23858). In addition, Cecil County was designated as a moderate nonattainment area while Kent and Queen Anne's Counties were designated as a marginal nonattainment area and Washington County became an early action compact area.

The June 2007 SIPs for the 1997 ozone NAAQS identified the ongoing mobile source and stationary source control measures that have been enacted to minimize emissions of NO_x and VOCs.

<u>Maryland Healthy Air Act</u>

In 2006, Maryland's legislature enacted the Healthy Air Act, a multi-pollutant approach to reducing emissions from the power sector. The Healthy Air Act required significant reductions in three key pollutants from the State's largest coal-fired power plants: NOx, SO_2 and mercury. The pollution controls required to reduce these emissions also resulted in significant reductions in emissions of particulate matter, hydrogen chloride and other air toxics. The Act also required Maryland to join the Regional Greenhouse Gas Initiative (RGGI), a multi-state collaborative regulatory initiative to reduce greenhouse gas emissions from power plants.

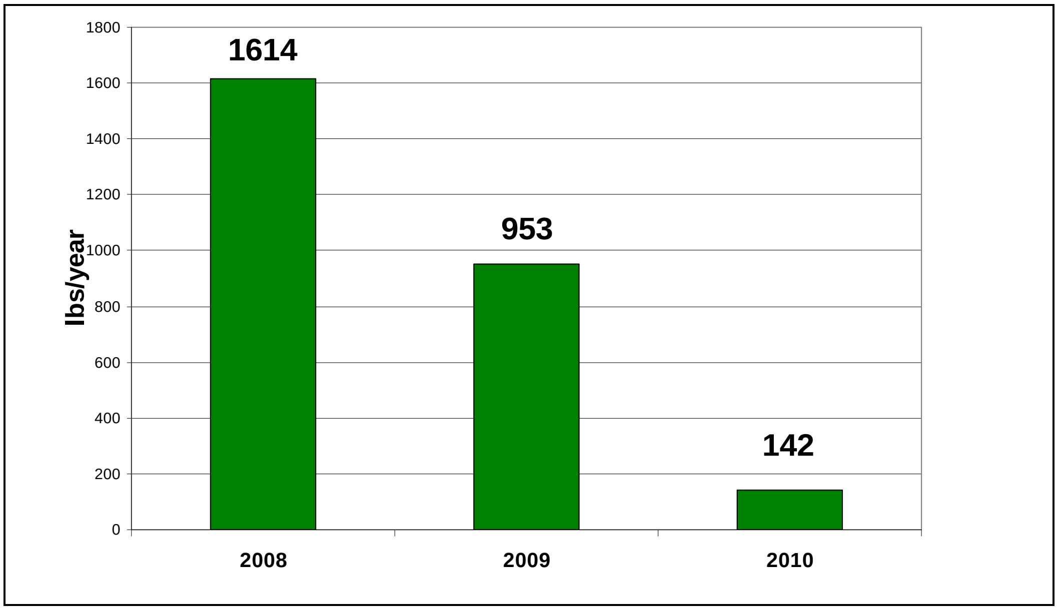
The Healthy Air Act is the most significant emissions reduction program ever adopted in Maryland. Widely applauded by the environmental community when it was enacted in 2006, the Healthy Air Act is now fully implemented and has achieved its goals. The Maryland Department of the Environment worked in close partnership with the State's power plants to plan for and implement the law. Maryland generators invested approximately $2.6 billion in new control technologies. This substantial investment funded a wide range of new pollution controls including:

- Six scrubbers to reduce SO_2 emissions
- Seven SCRs (Selective Catalytic Reduction) and 6 SNCRs (Selective Non-Catalytic Reduction) to reduce NOx emissions
- Two baghouses to reduce particulate and mercury emissions
- Two hydrated limestone injection systems to reduce SO_2 and mercury emissions
- Six powdered-activated-carbon (PAC) injection systems to reduce mercury emissions

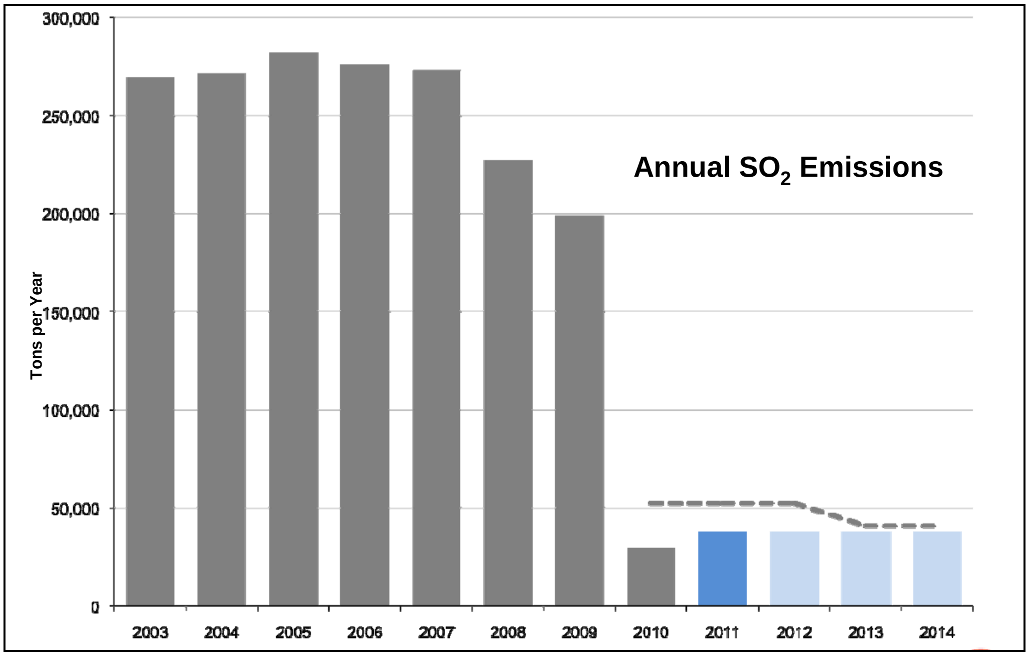
By 2010, the operation of these controls resulted in dramatic reductions in power plant emissions: Mercury emissions were reduced by more than 90 percent; SO_2 emissions by more than 80 percent; NOx emissions by more than 75 percent; direct particulate matter emissions by more than 60 percent; and hydrogen chloride emissions by approximately 83 percent. These results are shown in Figure A-3.

Figure A-3: Maryland Healthy Air Act Emission Reductions from Power Plants

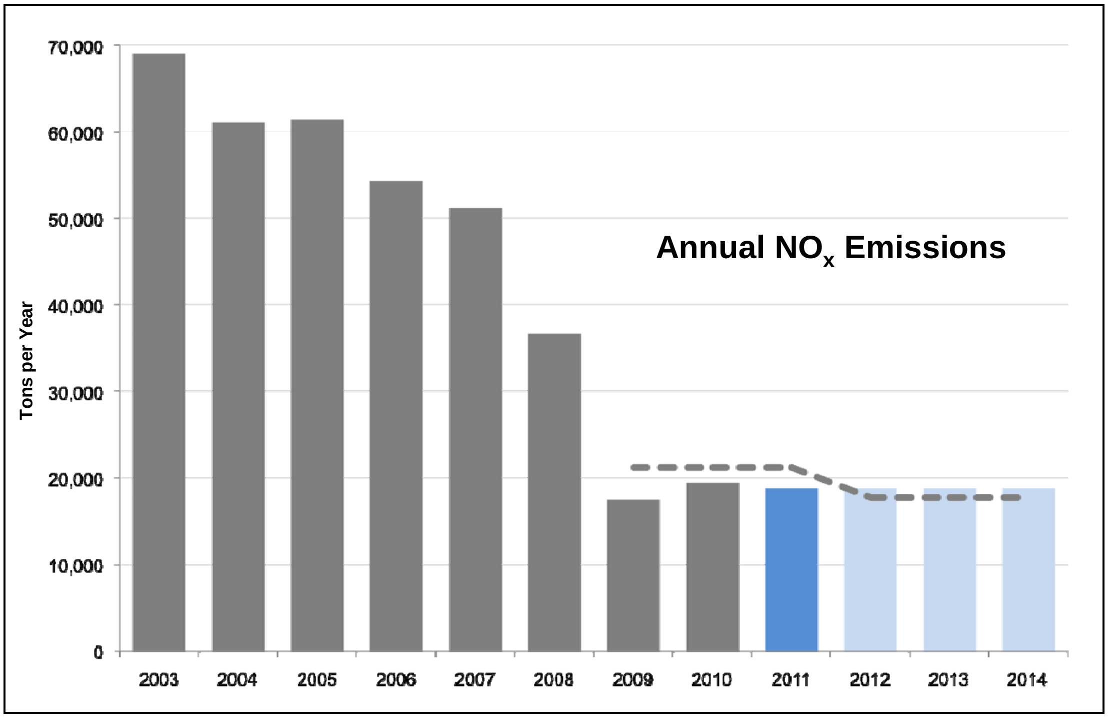
(a) Mercury Reductions (lbs/yr) by Year



(b) SO_2 Reductions (tons/year) by Year



(c) NOx Reductions (tons/year) by Year



The construction and installation of the controls also boosted Maryland's economy. The effort resulted in the creation of approximately 90 new permanent jobs, and during the peak construction period, more than 3,000 jobs.

On July 12, 2007 Maryland submitted the Healthy Air Act SIP revision to EPA. This SIP revision addresses a major portion of Maryland's 110(a)(2)(D)(i) obligations to submit a SIP revision that contains adequate provisions to prohibit air emissions from adversely affecting another state's air quality through interstate transport.

Maryland Control Measures beyond EGUs

As a CAL LEV state, Maryland has the toughest vehicle emission standards allowed by law. The Maryland Clean Car Program was adopted in 2007, after passage of the enabling legislation, as a strategy to reduce ozone-forming emissions and decrease the carbon footprint from the transportation sector. The program, which has emission standards more strict than the current federal standards, aims to improve air quality by reducing emissions from the cars and light trucks we drive everyday. Beginning with vehicle model year 2011, all cars and light trucks sold in Maryland are required to meet these newer, more stringent standards. VOCs and NOx will be reduced by approximately 3.55 and 5.18 more tons/day, respectively, by 2025.

Maryland has also regulated emissions from its mobile sector by implementing an enhanced vehicle emissions inspection and maintenance program (COMAR 11.14.08), Stage II gasoline pump controls (COMAR 26.11.24), heavy duty diesel engine controls (COMAR 26.11.20.06), Tier I and Tier II vehicle emissions standards (COMAR 26.11.20), the Clean Car Act of 2007 (CAL LEV) (COMAR 26.11.34), evaporative test procedures (COMAR 26.11.22), NLEV controls (COMAR 26.11.20.02), and reformulated gasoline in on-road vehicles (COMAR 26.11.20.03).

The State has also pursued significant regulation of non-EGU industrial sources, including Distributed Generation (COMAR 26.11.26), Portland Cement Manufacturing Plants (COMAR 26.11.29.03), Kraft Pulp Mills (COMAR 26.11.14), Yeast Manufacturing Plants (COMAR 26.11.19.17.17), Commercial Bakeries (COMAR 26.11.19.21.21), Iron and Steel Production (COMAR 26.11.10.01, .06, .07), Fuel Burning Equipment (COMAR 26.11.14.07), Incinerators (COMAR 26.11.08), and Internal Combustion Engines at Natural Gas Pipeline Compression Stations (COMAR 26.11.29.05).

Maryland has implemented a substantial number of VOC rules targeted at printers, consumer products, portable fuel containers, and industrial coating, adhesive and sealant operations. Pursuant to the requirements of §7511a(b)(2), Maryland has implemented RACT controls for all source categories covered by a Control Technique Guideline (CTG) issued by EPA, and on all other "major" stationary sources emitting 25 tons per year or more of VOC or NOx. Maryland RACT controls have been promulgated at COMAR 26.11.09.08 (Control of NOx emissions for Major Stationary Sources), COMAR 26.11.11 (Control of Petroleum Products Installations, Including Asphalt Paving and Asphalt Concrete Plants), COMAR 26.11.13 (Control of Gasoline and Volatile Organic Compound Storage and Handling), COMAR 26.11.19 (Volatile Organic Compounds from Specific Processes), COMAR 26.11.32 (Control of Emissions of Volatile Organic Compounds from Consumer Products), COMAR 26.11.33 (Architectural Coatings), and COMAR 26.11.35 (Volatile Organic Compounds from Adhesives and Sealants).

Maryland Nontraditional Voluntary and Innovative Control Measures

Maryland has also implemented the following programs in recent attainment SIPs that are listed as voluntary and innovative measures. MDE does not rely on any emission reductions projected as a result of implementation of these programs to demonstrate attainment because actual air quality benefits are uncertain and hard to quantify. These strategies however assist in the overall clean air goals in Maryland. A list of these programs is presented below:

- Regional Forest Canopy Program, Conservation, Restoration, and Expansion: expanded tree canopy cover is an innovative voluntary measure proposed to improve the air quality in the Baltimore region
- Clean Air Teleworking Initiative: encourages teleworking on bad air days
- High Electricity Demand Day (HEDD) Initiative: On March 2, 2007, the OTC states and the District of Columbia agreed to a MOU committing to reductions from the HEDD source sector
- Emission Reductions from Transportation Measures:
    - Clean and Efficient Strategies such as diesel retrofits;
    - Traffic Flow Improvement (CHART) to reduce congestion caused by accidents;
    - Truck Stop Electrification (TSE) to reduce diesel truck idling emissions;
    - Electronic Toll Collection;
    - Traffic Signal System Retiming;
    - Ride Share and Maryland Commuter Tax Credit;
    - Clean Commute Month including Bike to Work Day events;

- Transit Oriented Development;
- Bicycle/pedestrian Enhancements: the Maryland State Highway Administration (SHA) has worked to engineer and implement new and improved bicycle and pedestrian facilities, and has implemented programs to encourage pedestrians;
- Maryland Rail Commuter (MARC) Station parking enhancements, refurbishment of MARC rolling stock, and locomotive retrofits;
- Maryland Transportation Administration (MTA) and Locally Operated Transit Systems (LOTS) bus purchases;
- Bus service enhancements such as automatic vehicle locators (AVL), next bus arrivals posted on electronic signs at stops, and on the internet;
- Smart Card Implementation for easier travel between transit modes;
- Port of Baltimore Initiatives: crane retrofits, clean diesel in port vehicles, hybrid port fleet vehicles;

Maryland is currently working on a regulation that would establish emission reductions targets to be used as part of the transportation planning and transportation conformity processes. The new targets are substantially more restrictive than the current budgets used in the conformity process. The goal of this regulation is to achieve an additional NOx reduction from mobile sources of approximately 10 percent by encouraging smart transportation planning.

Local measures in Maryland have been all but exhausted. Maryland fully agrees that in the past many local emission reductions were necessary. Maryland developed and implemented necessary regulations with the involvement of our state's industry leaders. These regulations have resulted in large reductions in Maryland emissions. Very deep, additional regional reductions of NO_x will be needed for Maryland to attain the 1997 8-hour ozone standard as well as the 2008 ozone standard.

In total, Maryland's control program implements some of the most stringent local controls in the country. These controls have resulted in some of the lowest ozone precursor emissions rates in the country.

Emissions per capita in many states are greater than emissions per capita in Maryland, as shown in Table A-5. Non-OTR states are designated with an asterisk (*). NO_x emissions for these states are quadruple the NO_x emissions in Maryland. Some of the sources in these states are controlled but many are not and modeling shows they have an effect on Maryland's air quality. Many of these states export power into Maryland and other states and do so in a regulated environment where control costs are passed on to the consumer. A lack of requirements to control transport is a direct disadvantage to Maryland sources which are deregulated and operate in a merchant situation. This encourages growth in emissions in these regulated states as most plants are not yet operating at maximum capacity.

Table A-5: 2010 per Capita NOx Emissions for 10 States

State	Population (2010 census)	2010 NO_x lbs (EPA CAMD)	2010 Per Capita NO_x Emissions (lbs/per person)
MD	5,773,552	37,144,200	6.43
PA	12,702,379	250,972,400	19.76
VA	8,001,024	66,169,600	8.27
WV*	1,852,994	102,785,600	55.47
IN*	6,483,402	241,848,000	37.30
KY*	4,339,367	183,648,600	42.32
NY	19,378,102	47,421,800	2.45
NC*	9,535,483	99,222,400	10.41
TN*	6,346,105	61,979,200	9.77
MI*	9,883,640	152,260,000	15.41

There is no doubt that Maryland is highly urbanized containing a large city and half the suburbs of the nation's capital. Its small geographic size accentuates that density. Many of the new states being included in this petition for potential inclusion in the OTR are much larger in square miles and though they have major cities, their population density is diluted with the additional geographic area. These cities are experiencing growth just as Maryland is, yet they are not required to offset the growth in emissions that accompanies growth in population the way Maryland must because it has monitored data that fails to meet the 1997 and 2008 ozone standards and is the lone moderate nonattainment area in the east.

Growth in emissions includes growth in Vehicle Miles Traveled (VMT), growth in area sources and growth in non-road sources as well as growth in point sources and EGU capacity. Most, if not all, of these areas will do infrastructure planning with no mobile source emissions budget-only the build/no build test which supports growth in mobile source emissions. The large geographic areas of these states encourage growth in VMT. Maryland has taken numerous steps to both reduce emissions through technological measures and to encourage reductions in VMT. We are currently waiting to implement a more stringent Clean Cars Program. These are difficult steps to take when they are not echoed in surrounding states and they do little to improve air quality in your own state.

Maryland CAIR Impacts

Maryland adopted the OTC NOx MOU, the NOx Budget Program, and the CAIR Program for EGUs in Maryland and then went further to adopt the Maryland Healthy Air Act which was more stringent than CAIR. Despite the reductions required by the CAIR, EPA's technical modeling undertaken in 2005 predicted that nine counties in Maryland would exceed 75 ppb in 2015, which is nonattainment for the 2008 Ozone NAAQS, as shown in Table A-6. In fact, the entire northeast corridor is projected to be in nonattainment for the 2008 ozone standard in 2015.

Table A-6: CAIR Modeled Nonattainment Areas in Maryland in 2015[18]

CMSA/MSA	County	2015 Base (ppb)	2015 CAIR (ppb)	Impact of CAIR in 2015 (ppb)
Washington-Baltimore, DC-MD	Anne Arundel	86.0	84.9	-1.1
Washington-Baltimore, DC-MD	Baltimore	81.9	81.0	-0.9
Washington-Baltimore, DC-MD	Carroll	77.8	76.3	-1.5
Philadelphia, PA-MD-DE-NJ	Cecil	86.9	85.4	-1.5
Washington-Baltimore, DC-MD	Charles	76.5	75.6	-0.9
Washington-Baltimore, DC-MD	Harford	90.6	89.6	-1.0
Washington-Baltimore, DC-MD	Kent	83.4	82.3	-1.1
Washington-Baltimore, DC-MD	Montgomery	77.4	76.4	-1.0
Washington-Baltimore, DC-MD	Prince Georges	81.9	80.9	-1.0

Maryland 2008 Ozone NAAQS Implementation Rule Impacts

In some areas of Maryland we need controls in place beginning in 2013 to meet 2015 attainment deadlines for the 75 ppb ozone NAAQS. In other areas such as the Baltimore serious nonattainment area, additional transport reductions are needed immediately to prevent this area from becoming classified as severe by the end of 2014. Judgments regarding air quality compliance with the 0.08 ppm standard are on-going. EPA modeling from the CSAPR shows that 49 percent of the Baltimore design value is attributable to transport[19]. Subtracting the 32.7 ppb total contribution from all upwind states for 2012, as determined by CSAPR modeling, Baltimore's current design value of under 92 ppb would be under 60 ppb and in compliance with the current 8-hour ozone NAAQS of 75 ppb.

Maryland 2012 Monitoring Data

Despite the emission reductions being achieved in Maryland and other OTC states, 2012 monitoring data in Maryland demonstrates a trend of increasing design values from 2010 to 2012 at a number of the air quality monitors in the Baltimore and Washington nonattainment areas. Table A-7 gives 2012 design values for all Maryland ozone monitors. DVs that exceed the 2008 ozone NAAQS are shown in red.

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[18] Source: Appendix E, Technical Support Document for the Final Clean Air Interstate Rule, Air Quality Modeling, March 2005, http://www.epa.gov/cair/technical.html
[19] Source: Table F-1c. Contribution metrics for 8-hour ozone 2012 maintenance receptors – part 1, Air Quality Modeling Final Transport Rule Technical Support Document (2010)

Table A-7: Maryland 8-hour Ozone Design Values for 2012

Station	County	4th Max 2010 (ppb)	4th Max 2011 (ppb)	4th Max 2012 (ppb)	2010-2012 DV(ppb)
Davidsonville	Anne Arundel	87	87	87	87
Padonia	Baltimore	78	86	82	82
Essex	Baltimore	84	85	83	84
Calvert Co.	Calvert	87	82	82	83
South Carroll	Carroll	83	79	75	79
Fairhill	Cecil	82	89	87	86
S. Maryland	Charles	82	85	84	83
Frederick Co.	Frederick	83	77	78	79
Piney Run	Garrett	78	70	78	75
Edgewood	Harford	96	98	86	93
Aldino	Harford	80	85	83	82
Millington	Kent	74	84	89	82
Rockville	Montgomery	77	81	73	77
HU-Beltsville	Prince George's	85	83	79	82
PG Co. Equestrian Ctr	Prince George's	85	86	90	87
Hagerstown	Washington	78	74	74	75
Furley ES Rec Ctr	Baltimore (City)	74	82	71	75

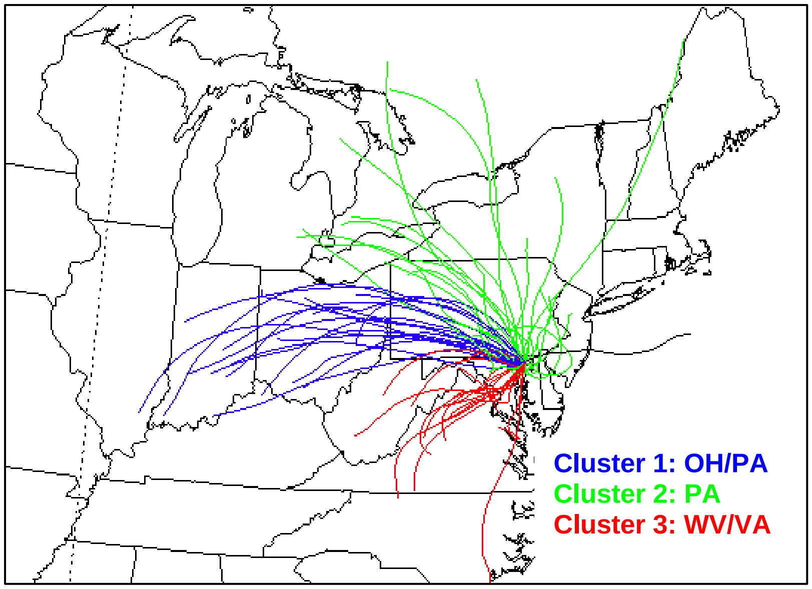
Of the 17 Maryland ozone monitors, 14 have 2012 design values over the 75 ppb standard. The three remaining monitors are exactly at 75 ppb, making it likely that they will be difficult to maintain below the NAAQS if there is any increase of ozone or precursors that travel to Maryland from upwind states.

Maryland Scientific Efforts to Determine Ozone Sources

As of 2012, Maryland is only 0.002 lbs/mmBtu away from the required CAIR rate for 2015. Maryland has already begun work on enhanced RACT reductions from EGUs. Scientific analyses initiated by MDE show that transported emissions from states that have not controlled EGUs to the extent Maryland has play a significant role in monitored air quality data in Maryland.

Scientific analysis from the University of Maryland College Park (UMD) determined the most common transport routes for Maryland ozone exceedance days. Using back trajectories from days of UMD of aircraft measurement over the last decade, this research identified five meteorological regimes associated with high ozone days, as shown in Figure A-4. The largest cluster is westerly transport through Ohio and Pennsylvania. The second largest cluster is northwest transport through Pennsylvania. The third largest cluster is southwest transport from Virginia and West Virginia. Two smaller local clusters were also identified: recirculation and stagnation.

Figure A-4 HYSPLIT 48-Hour Back-Trajectory (1000 m)



Note that the four states with the largest significant contributions to Maryland ozone in the CSAPR modeling (Virginia, Pennsylvania, Ohio, and West Virginia) match the four states identified in the UMD cluster analysis shown in Figure A-4 above.

In July 2011, NASA led a major air quality field campaign over Maryland. The project was called **DISCOVER-AQ**, which stands for Deriving Information on Surface conditions from Column and Vertically Resolved Observations Relevant to Air Quality. Among the core objectives of this campaign were to measure pollutant altitude profiles to better correlate those concentrations with surface values, as well as to determine the origins of tropospheric ozone and PM over the Baltimore-Washington area. Preliminary results of the DISCOVER-AQ campaign, exhibited in dozens of presentations at the 2011 American Geophysical Union Fall Meeting, indicate substantial concentrations of ozone and ozone precursors are transported into the Maryland area via the free troposphere and then mix down to the surface.

Chemical lifetimes are longer and transport faster in the lower free troposphere than at the surface and, as a result, ozone and ozone precursors are commonly carried hundreds of miles from their sources. There is an extensive body of scientific findings proving that regional transport plays a significant role in urban high ozone episodes in Maryland. During the summer ozone season, scientists from UMD, Howard University (HU), University of Maryland Baltimore County (UMBC) and others have used aircraft, ozonesondes, and remote sensing techniques to show that both ozone and its precursors are transported from nearby upwind states into Maryland.

More than 15 years of aircraft measurements by the UMD, have proven that aloft air coming into Maryland contains ozone concentrations between 60 – 100 ppb as the result of sources in the nearby states; including Ohio, West Virginia, Pennsylvania, and Virginia. Each of these states contributes substantially to Maryland's air quality problems. *Taubman et al*. (2006) compared measured ozone profiles upwind and downwind of the Baltimore area, and determined that when the greatest cluster trajectory density lay over the Ohio River Valley (~59% of the profiles), transport accounted for 69–82% of the afternoon boundary layer ozone in Maryland[20]. Under stagnant conditions (~27% of the profiles), transport accounted for 58% of the afternoon boundary layer ozone in Maryland.

Based on aircraft measurements made during a nine year period (1996-2004) by scientists at the UMD, morning ozone profiles show the highest aloft median ozone concentrations of about 70 ppb at approximately 1,000 meters above the surface. Once the nocturnal boundary layer breaks down this ozone (plus ozone precursors) are poised to mix to the surface and cause Maryland to experience another ozone exceedance day.

Ozone concentrations well above the 75 ppb NAAQS have been measured repeatedly over the western (climatologically upwind) boundaries of Maryland. These consistently high concentrations of ozone and ozone precursors along with wind patterns (based on back trajectories) make a compelling case that ozone is being transported into Maryland from areas outside the State.

Without the source of Maryland's ozone and ozone precursors included in the Ozone Transport Region, it will be difficult, if not impossible, for Maryland to comply with the CAA.

[20] Taubman, B.F., J.C. Hains, A.M. Thompson, L.T. Marufu, B.G. Doddridge, J.W. Stehr, C.A. Piety, and R.R. Dickerson (2006), 2006, 'Aircraft vertical profiles of trace gas and aerosol pollution over the mid-Atlantic United States: Statistics and meteorological cluster analysis', *J. Geophys. Res*., 111(D10), D10S07 MAR 29 2006.