CHAPTER 8 - LOCAL CONTROL MEASURE ANALYSIS

The emission projections described in the previous chapters of this report reflect Federal measures and state and local control programs that were on-the-books as of September 2005, but do not include the additional local measures expected to be adopted to achieve further progress toward 8-hour ozone and $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) attainment. This chapter describes the analysis that was performed to estimate the emission benefits resulting from implementation of the 8-hour ozone NAAQS, the $PM_{2.5}$ NAAQS, and the Clean Air Visibility Rule, or CAVR (sometimes referred to as the best available retrofit technology, or BART, rule). These are all proposed or final rules that have been promulgated recently by EPA. The baseline for performing this local control measures evaluation is the core scenario from the *with-CAAA* 2010 and 2020 cases. Source-specific emissions are used for all EGU and non-EGU point source analyses. The 2010 and 2020 core scenario emission estimates for onroad, nonroad and nonpoint sectors are at the county-level.

The local control measure analysis was performed in three steps: 8-hour ozone NAAQS implementation; CAVR rule implementation; and PM NAAQS implementation. Note that our analysis assumes that efforts toward compliance with the 1-hour ozone NAAQS and the current PM_{10} NAAQS for historical years are captured in the core scenarios as they currently exist, which include local controls identified by RPOs and which are described in the previous chapters of this report.

The main cost and control measure database used for these analyses was developed from version 4.1 of AirControlNET released in September 2005, with some updates to incorporate 1-hour ozone NAAQS local control measure information and additional onroad mobile source control measures. The analysis year for the ozone and PM NAAQS analyses is 2010; the Project Team applied local controls identified for 2010 to generate results for 2020. The analysis year for the CAVR is 2020, since it is expected that the majority of controls implemented to satisfy these rule requirements will occur after 2010. The methods used for each analysis are described below, in the order in which they were implemented as further incremental reductions from the core scenario emissions inventories.

8-Hour Ozone Analysis

This analysis focused on the implementation emission reductions and costs in nonattainment areas (NAAs) in the United States. The corresponding analysis of the costs of these controls is presented in a separate report. These nonattainment areas are divided into two overlapping groups. The first group includes areas where additional local controls are anticipated to be needed to meet the NAAQS by 2010. Reduction target levels for this group of areas were derived directly from the area-specific target emissions reduction levels derived to support the ozone implementation economic analysis (Pechan 2005a). Because percentage reduction (both VOC and NO_x) emission targets were used, and because the Federal rule inventories and target years used in the 812 analysis differ from those used in the economic analysis (the 812 analysis starts from a 2002 baseline, while the previous EPA analyses use a 2001 platform–developed from a 1999 NEI baseline), the actual absolute reductions for each nonattainment area differ slightly from those modeled in the economic analysis.

The second group consists of 8-hour ozone nonattainment areas for which certain mandatory Clean Air Act (CAA) control obligations for moderate and above areas are required pursuant to Subpart 2 of the Act. Mandatory controls include adoption of an inspection and maintenance program for light-duty vehicles and a 15 percent VOC emission reduction requirement. For purposes of this analysis, we assume that both Group 1 and Group 2 areas require adoption of reasonable available control technology (RACT) on large stationary sources (those emitting more than 100 tons of VOC or NO_x per year) in areas that have not already adopted RACT. It should be noted that, under the CAA, states determine RACT levels and applicability on a case-by-case or source category basis considering EPA guidance and other information. Therefore, RACT levels eventually set by individual states may differ from the RACT levels adopted for this analysis.

An important caveat for the 8-hour ozone NAAQS attainment analysis is that VOC and NO_x emission reduction targets were not estimated by EPA for California 8-hour ozone nonattainment areas. This decision was motivated primarily by poor model performance at the time simulations were conducted for ozone concentrations in various ozone nonattainment areas within California. Therefore, for 8-hour ozone nonattainment areas in California, only the RACT and reasonable further progress (RFP) requirements were applied to estimate the VOC and NO_x emission reductions expected to result from the 8-hour NAAQS implementation. This may underestimate the emission reductions and costs in California 8-hour ozone nonattainment areas. Based on the 2010 and 2020 emissions in the California 8 hour ozone nonattainment areas, and reductions required in other large cities with persistent ozone problems it is expected that combined VOC and NOx emission reductions necessary for California compliance with the 8 hour ozone NAAQS might be in the range of 100,000 tons per year. Necessary reductions might also be less than 100,000 tons, because aggressive reductions in ozone precursors have long been pursued in California and many "on-the-books" measures to attain the existing 1-hour ozone standard may yield significant progress toward attainment of the new 8-hour standard.

1. RACT and I/M

To estimate the contributions of electricity generating units (EGUs) and non-EGU point sources toward achieving the emission reductions needed to attain, this analysis applied RACT controls on EGUs and non-EGU point sources where RACT was required. It should be noted, however, that the Phase II implementation rule determined that the Clean Air Interstate Rule (CAIR) satisfies RACT for participating EGUs in states where all required CAIR reductions are obtained from EGUs. As a general rule, 8-hour ozone nonattainment area counties were assumed to have already met their RACT requirements if they were previously designated as nonattainment of the 1-hour ozone NAAQS.

For this study, RACT applicability was determined on a control measure basis by adapting criteria initially developed for the 8 hour ozone NAAQS implementation economic analysis. Note that all of the criteria have to be met:

- Current NO_x control efficiency is zero, i.e., it is an uncontrolled source in 2002;
- Total annual NO_x emissions of the source greater than 100 tons (i.e., large source);
- Control efficiency of the control is less than 81 percent for NO_x;
- Control cost is less than $1,580 per ton NO_x reduced (i.e., cost effective control is available); and
- Control measure has the lowest NO_x control efficiency from all that are available for that source (i.e., minimum control available).

I/M controls are then applied to counties where required. Once I/M and RACT controls were applied, the cost of meeting the additional emission reduction requirements (RFP and Target levels) were determined for each area by using control techniques, efficiencies, and cost databases in concert with the incremental emission reduction and progress requirements mentioned above. For additional local controls, a least-cost algorithm was used to identify and apply the control measures to meet the progress requirements, where applicable. First, the potential sources of emission and reductions and their costs were identified. Next, the lowest cost, second lowest, third lowest, and so forth, control measures were selected until the progress requirement was met. Because of the discrete nature of control measures and their efficiencies, sometimes the emission reduction or progress target is exceeded. Any excess might be used as an offset against new source growth emissions, if the excess were significant.

2. RFP

Reasonable further progress (RFP) is the attainment program element requiring incremental reductions in the emissions of the applicable air pollutant pursuant to Part D of the Clean Air Act (CAA) and its Amendments. The RFP requirements in the CAAA are intended to ensure that each ozone nonattainment area makes progress toward achieving sufficient precursor emission reductions to attain the national ambient air quality standards for ozone. More specifically, the Act requires certain ozone nonattainment areas classified as moderate or above to achieve actual VOC emission reductions of at least 15 percent over an initial 6-year period, and subsequently to achieve further emission reduction progress of three percent per year averaged over each consecutive three-year period until attainment.

The first step needed to determine if additional RFP emission reductions are required in certain 8-hour ozone nonattainment areas is to compare VOC emission estimates of 2002 with 2008. This is because the VOC emission reduction requirements obtained from 2002 to 2008 as a result of on-the-books Federal and local air pollution control programs count toward the 15 percent reduction requirement. For the 8-hour Ozone Implementation rule, 2002 is the base year. Exhibit 8-1 shows the VOC progress requirements to meet a 15 percent reduction from 2002 emission levels by 2008. The 15 percent reduction calculation allows 100 percent credit for VOC reductions achieved from 2002 to 2008 through implementation of other emission reduction programs, such as implementation of Ozone Transport Commission model rules to reduce VOC solvent emissions. The 2008 emissions were estimated by interpolating 2002 and 2010 emission estimates.

Exhibit 8-1. Reasonable Further Progress Requirements for VOC in Designated 8-Hour Ozone Nonattainment Areas

Area Name	Base Case 2008 VOC Emissions (tons)	Estimated Additional VOC Reductions to Meet 15% RFP Requirements (tons)	Estimated Additional VOC Reductions Observed in 2008 as a % of 2008 Base Case Emissions
Allegan Co, MI	11,446	1,876	16.4%
Atlanta, GA	228,148	3,637	1.6%
Baltimore, MD	95,268	13,256	13.9%
Beaumont-Port Arthur, TX	40,683	8,607	21.2%
Buffalo-Niagara Falls, NY	65,367	2,325	3.6%
Chicago-Gary-Lake County, IL-IN	92,000	-	0.0%
Cleveland-Akron-Lorain, OH	126,044	13,319	10.6%
Columbus, OH	58,772	5,245	8.9%
Dallas-Fort Worth, TX	162,128	33,197	20.5%
Detroit-Ann Arbor, MI	170,290	11,253	6.6%
Door Co, WI	4,412	1,184	26.8%
Houston-Galveston-Brazoria, TX	210,185	49,043	23.3%
Indianapolis, IN	58,050	-	0.0%
Kent and Queen Anne's Cos, MD	3,918	90	2.3%
Kern Co (Eastern Kern), CA	33,816	1,115	3.3%
Knoxville, TN	48,788	2,372	4.9%
Los Angeles South Coast Air Basin, CA	297,667	6,790	2.3%
Milwaukee-Racine, WI	99,269	12,621	12.7%
Nevada Co. (Western Part), CA	4,461	-	0.0%
New York-N. New Jersey-Long Island,NY-NJ	571,745	-	0.0%
Philadelphia-Wilmin-Atlantic Ci,PA-NJ-MD	256,489	9,401	3.7%
Providence (All RI), RI	26,859	-	0.0%
Raleigh-Durham-Chapel Hill, NC	64,458	9,134	14.2%
Sacramento Metro, CA	61,301	5,173	8.4%
San Diego, CA	73,409	9,265	12.6%
San Joaquin Valley, CA	106,002	11,941	11.3%
Sheboygan, WI	8,771	1,538	17.5%
South Bend-Elkhart, IN	24,937	266	1.1%
Ventura Co, CA	24,718	6,802	27.5%
Washington, DC-MD-VA	135,314	10,785	8.0%
Youngstown-Warren-Sharon, OH-PA	29,605	1,104	3.7%

The one exception to the 100 percent credit allowance is that mobile source reductions are discounted by 13 percent (i.e., only 87 percent of mobile source reductions are creditable toward the RFP progress requirements). The reason this discount is applied is because there are certain reductions in motor vehicle emissions that will occur in the future, but are the result of actions taken prior to the enactment of the 1990 CAAA. (The methods to account for non-creditable reductions when calculating RFP Targets for the 2008 and Later RFP Milestone Years is provided in Appendix A to the Preamble for the Final Rule to Implement the 8-Hour Ozone NAAQS, at 70 FR 71612.)

The reductions required to meet RFP targets are allowed from sources within 100 km radius for VOC reductions and within 200 km radius for NO_x reductions. However, each time a source/control measure from outside the nonattainment area boundary was selected to meet an RFP target requirement, the RFP target for that area was recalculated. RFP target recalculation was performed by adding the selected source emissions to the base inventory of the area. The RFP target recalculation followed the RFP target calculation methods described below.

3. RFP Calculation Methodology

The first step in determining if additional RFP emission reductions are required is to compare VOC emission estimates for calendar year 2002 with those estimated for 2008. This computation is necessary because the VOC emission reductions obtained from 2002 to 2008 as a result of on-the-books Federal and local air pollution control programs count toward the 15 percent reduction requirement.

The RFP requirement for each nonattainment area is calculated by subtracting 85 percent of 2002 emissions (i.e., reduction by 15 percent) from the 2008 emissions, assuming that mobile source emission changes are discounted by 13 percent. If this value is greater than zero, this is the RFP reduction requirement for that nonattainment area. If that value is less than or equal to zero, no further RFP reduction is required.

Below is a sample calculation for Baltimore, MD nonattainment area:

2002 emissions totals = 99,796 tons VOC
2010 with CAAA scenario emissions totals = 93,758 tons

Interpolation of 2002& 2010 yields 2008 emissions = 95,267 tons

After discounting of mobile emissions by 13 percent, 2002 emission = 96,484 tons.

Additional VOC tons required to reduce = (2008 Emissions) - (85 percent of discounted 2002 Emissions)
= (95,267) - (0.85 x 96,484)
= 13,256 tons

4. Additional Emission Reductions to Meet Targets

Similarly, and after applying I/M, RACT, and RFP, if an area required additional reductions to meet their emission reduction target for NO_x and/or VOC (e.g., Group 1 areas), source/controls within 100 km radius for VOC reductions and within 200 km radius for NO_x reductions are selected on a least cost basis, as described above for RFP. Exhibits 8-2a and 8-2b provide the NO_x and VOC emission reduction results by NAA for 2010 and 2020, respectively. Emission reductions shown for these nonattainment areas include RACT reductions, RFP-associated reductions, as well as bringing areas into attainment with the 8-hour ozone requirements.

Exhibit 8-2a. 8-Hour Ozone Emission Reduction Results for 2010

	VOC Emission Reduction (tons)					NO_x Emission Reduction (tons)				
Area Name	**EGU**	**Point**	**Nonpoint**	**Onroad**	**Nonroad**	**EGU**	**Point**	**Nonpoint**	**Onroad**	**Nonroad**
Allegan Co, MI	-	-	1,154	123	-	-	-	-	146	-
Atlanta, GA	-	-	3,667	-	-	7,091	-	132	-	-
Baltimore, MD	-	58	12,858	-	-	4,615	2,280	515	841	-
Beaumont-Port Arthur, TX	-	-	1,870	469	-	-	14,913	58	722	-
Buffalo-Niagara Falls, NY	-	-	2,654	-	-	11,202	3,278	376	-	-
Chicago-Gary-Lake County, IL-IN	-	105	21,893	-	-	12,041	25,590	1,226	-	-
Chicago-Gary-Lake County, IL-IN (Cook, IL & Lake, IN)	-	-	24,734	-	-	3,644	10,962	1,227	-	-
Cleveland-Akron-Lorain, OH	-	-	11,690	99	-	8,080	9,274	307	110	-
Columbus, OH	-	-	3,917	1,497	-	-	1,552	54	1,620	-
Dallas-Fort Worth, TX	-	-	20,986	1,679	-	12,023	20,344	99	2,013	-
Detroit-Ann Arbor, MI	-	99	13,321	4,506	-	-	-	-	4,951	-
Door Co, WI	-	-	1,505	82	-	1,367	6,571	107	524	-
Houston-Galveston-Brazoria, TX	-	62	15,504	1,917	-	3,468	30,370	683	5,038	-
Indianapolis, IN	-	-	-	-	-	345	98	54	-	-
Kent and Queen Anne's Cos, MD	-	-	393	21	-	-	-	5	77	-
Knoxville, TN	-	-	1,506	911	-	416	1,029	-	966	-
Los Angeles South Coast Air Basin, CA	-	-	7,391	-	-	-	-	-	-	-
Milwaukee-Racine, WI	-	32	9,488	183	-	7,038	2,483	519	1,531	-
New York-N. New Jersey-Long Island,NY-NJ	-	25	92,351	292	-	9,180	13,204	2,449	5,987	-
Philadelphia-Wilmin-Atlantic Ci,PA-NJ-MD	-	51	57,280	235	-	38,109	22,777	1,698	4,137	-
Providence (All RI), RI	-	-	-	47	-	-	267	101	387	-
Raleigh-Durham-Chapel Hill, NC	-	91	9,013	32	-	919	-	-	34	-
Sacramento Metro, CA	-	70	4,987	-	-	-	-	-	-	-
San Diego, CA	-	-	7,027	-	-	-	-	-	-	-
San Joaquin Valley, CA	-	26	9,370	-	-	-	-	-	-	-
Sheboygan, WI	-	51	4,162	34	-	1,897	1,729	79	303	-
South Bend-Elkhart, IN	-	-	2,562	-	-	-	997	180	-	-
Ventura Co, CA	-	-	2,512	-	-	-	-	-	-	-
Washington DC	-	31	10,751	38	-	7,867	7,665	486	1,071	-
Youngstown-Warren-Sharon, PA-OH	-	-	1,558	525	-	1,135	432	35	551	-
TOTAL	**-**	**702**	**356,105**	**12,690**	**-**	**130,435**	**175,816**	**10,390**	**31,010**	**-**

Exhibit 8-2b. 8-Hour Ozone Emission Reduction Results for 2020

	VOC Emission Reduction (tons)					NO_x Emission Reduction (tons)				
Area Name	**EGU**	**Point**	**Nonpoint**	**Onroad**	**Nonroad**	**EGU**	**Point**	**Nonpoint**	**Onroad**	**Nonroad**
Allegan Co, MI	-	-	1,315	202	-	-	-	-	207	-
Atlanta, GA	-	-	3,637	-	-	9,077	522	157	-	-
Baltimore, MD	-	104	13,670	-	-	3,275	2,609	558	34	-
Beaumont-Port Arthur, TX	-	-	2,310	673	-	-	16,866	60	618	-
Buffalo-Niagara Falls, NY	-	-	2,588	58	-	6,821	3,424	369	169	-
Chicago-Gary-Lake County, IL-IN	-	116	25,296	-	-	6,852	25,249	1,256	-	-
Chicago-Gary-Lake County, IL-IN (Cook, IL & Lake, IN)	-	-	28,113	-	-	3,696	7,320	1,269	-	-
Cleveland-Akron-Lorain, OH	-	-	11,765	146	-	6,846	9,723	183	141	-
Columbus, OH	-	-	2,924	2,344	-	-	1,682	53	2,215	-
Dallas-Fort Worth, TX	-	-	25,626	2,955	-	7,444	23,748	110	2,815	-
Detroit-Ann Arbor, MI	-	129	11,030	6,658	-	-	-	-	6,377	-
Door Co, WI	-	-	1,684	60	-	3,400	5,547	113	97	-
Houston-Galveston-Brazoria, TX	-	84	19,029	2,804	-	2,644	30,625	710	2,999	-
Indianapolis, IN	-	-	-	-	-	345	127	55	-	-
Kent and Queen Anne's Cos, MD	-	-	443	25	-	-	-	5	31	-
Knoxville, TN	-	-	944	1,444	-	416	1,069	-	1,345	-
Los Angeles South Coast Air Basin, CA	-	-	6,952	-	-	-	-	-	-	-
Milwaukee-Racine, WI	-	30	9,946	60	-	5,471	2,690	549	172	-
New York-N. New Jersey-Long Island,NY-NJ	-	23	106,902	96	-	4,567	13,627	2,527	421	-
Philadelphia-Wilmin-Atlantic Ci,PA-NJ-MD	-	35	63,680	79	-	28,500	22,527	1,744	319	-
Providence (All RI), RI	-	-	-	15	-	-	259	106	43	-
Raleigh-Durham-Chapel Hill, NC	-	80	9,191	51	-	919	-	-	47	-
Sacramento Metro, CA	-	-	5,292	-	-	-	-	-	-	-
San Diego, CA	-	-	9,088	-	-	-	-	-	-	-
San Joaquin Valley, CA	-	31	10,103	-	-	-	-	-	-	-
Sheboygan, WI	-	80	2,699	11	-	2,599	2,065	84	34	-
South Bend-Elkhart, IN	-	-	2,835	-	-	-	894	180	-	-
Ventura Co, CA	-	-	3,299	-	-	-	-	-	-	-
Washington DC	-	41	9,912	13	-	6,351	8,140	821	71	-
Youngstown-Warren-Sharon, PA-OH	-	-	1,527	751	-	1,135	450	23	687	-
TOTAL	**-**	**751**	**391,801**	**18,445**	**-**	**100,356**	**179,161**	**10,931**	**18,843**	**-**

Exhibits 8-2a and 8-2b show the projected VOC and NO_x emission reductions by sector that are estimated by this analysis to be selected as part of the attainment plan for each 8-hour ozone nonattainment area. For VOC, this Exhibit shows that for most nonattainment areas, the majority of the expected emission reductions will come from the nonpoint source sector. This is to be expected as most of the major stationary source VOC emitters have previous control requirements via RACT requirements in 1-hour ozone control plans and/or Maximum Achievable Control Technology (MACT) requirements as part of the CAAA90 Title III hazardous air pollutant (HAP) control program. Nonpoint source VOC control selection examples include controlling solvents beyond Federal requirements in states that have not already adopted the Ozone Transport Commission (OTC) model rules, and the OTC states select more stringent solvent control measures, such as those that have been adopted in certain California air pollution control districts.

Exhibits 8-2a and 8-2b show that NO_x control measure selection is more evenly spread among the sectors than the VOC selection. NO_x control measure choices in any individual area are a function of the source mix and the availability of cost effective controls by sector. EGU NO_x controls in the 8-hour ozone nonattainment area are typically selective catalytic reduction (SCR) installations at units that have not already installed these controls to meet acid rain, Clean Air Interstate Rule (CAIR), or NO_x SIP Call requirements. Non-EGU point source NO_x controls selected include low NO_x burners, selective non-catalytic reduction (SNCR), and SCR installation on various industrial fuel combustors (heaters, boilers, kilns and incinerators). Onroad and nonroad NO_x emission reductions in Exhibits 8-2a and 8-2b reflect diesel retrofits and restricted idling practices.

Note that the modeled VOC and NOx emission reductions for some 8-hour ozone nonattainment areas are not sufficient to bring them into attainment of the 8-hour standard (based on the emission reduction targets that were used). Exhibits 8-3a and 8-3b provide an overview of 2010 and 2020 VOC and NO_x emission reduction targets and the reductions in 2010 and 2020 emissions that were available in AirControlNET to achieve emission reductions during these respective time periods. The 8-hour ozone nonattainment areas not listed in Exhibits 8-3a and 8-3b are either projected to attain the NAAQS by 2010 (for Exhibit 8-3a) or 2020 (for Exhibit 8-3b) based on projected emission changes since their designation, or they are California ozone nonattainment areas for which no reliable emission reduction targets were available.

Depending on the modeled response of ozone concentrations to changes in VOC and NO_x emissions, VOC and NO_x emission reduction targets are within the range of zero to 50 percent reductions in these pollutants, with the VOC emission reduction target often being zero (i.e., no additional emission reduction in 2010 is expected to be needed from the emission levels achieved in the with-CAAA scenario). Because the VOC and NO_x emission reduction columns include the emission reductions associated with meeting RACT and RFP requirements, these emission reductions can be well above the pollutant-specific targets (especially when the target is zero).

Exhibits 8-3a and 8-3b show that applying known identifiable control measures are insufficient to achieve the needed VOC emission reductions to attain the 8-hour ozone NAAQS in four nonattainment areas outside of California: Chicago, Houston-Galveston, New York, and Philadelphia. Chicago is listed twice in Exhibits 8-3a and 8-3b because Cook County, IL and Lake County, IN have separate attainment targets from those estimated for the remaining counties in the nonattainment area. In total, the VOC emissions shortfall in these four 8-hour ozone nonattainment areas is about 352,000 tons per year in 2010. New and innovative emission control measures would be needed to achieve further reductions in VOC emissions beyond what is shown in Exhibit 8-3a.

Exhibit 8-3a. Comparison of Attainment Targets with Reductions Achieved Via Local Measures in 2010

Area Name	VOC Reduction Target (tons)	VOC Reduced, Identified Measures (tons)	Remainder Unidentified Measures (tons)	NO_x Reduction Target (tons)	NO_x Reduced, Identified Measures (tons)	Remainder Unidentified Measures (tons)
Atlanta	0	3667		6,609	7,223	
Baltimore	0	12,916		31,685	8,252	23,433
Buffalo	0	2,654		13,551	14,856	
Beaumont	0	2,339		3,178	15,694	
Chicago - Cook/Lake Cos.	31,555	24,734	6,821	22,904	15,832	7,072
Chicago - Rest	42,331	21,998	20,333	40,539	40,539	
Cleveland	0	11,789		19,111	17,770	1,341
Dallas - FT Worth	0	22,665		30,613	34,480	
Detroit	17,817	17,927		0	4,921	
Houston - Galveston	107,591	17,483	90,108	125,742	39,559	86,183
Kent and Queen Annes	0	415		142	82	
Milwaukee	0	9,702		30,253	11,572	18,681
New York	264,064	92,668	171,396	180,417	30,819	149,598
Philadelphia	120,967	57,566	63,401	103,440	66,721	36,719
Providence	0	47		2,668	755	1,913
Sheboygan	0	4,247		2,889	4,009	
Washington	0	10,821		16,446	17,089	
Total		**313,638**	**352,059**		**330,173**	**324,940**

Note: In the Chicago, IL-IN 8-hour ozone nonattainment area, Cook County IL and Lake County, IN have separate attainment targets from those estimated for the remaining counties in the nonattainment area. Therefore, these two areas are shown separately in this exhibit.

Exhibit 8-3a also shows that there are expected NO_x emission reduction shortfalls in eight 8-hour ozone nonattainment areas in 2010, with these shortfalls ranging from as little as 1,341 tons (in Cleveland) to 150,000 tons (in the New York City nonattainment area). Factors affecting an area's ability to achieve significant NO_x emission reductions from the 2010 *with-CAAA* scenario include whether the area's major EGU NO_x sources are already well controlled in the core scenario, the presence or absence of a significant industrial base in the nonattainment area (or within a 200 km radius), and their existing 2010 control programs for stationary source NO_x emitters. For example, the Houston-Galveston area NO_x control simulation begins with a NO_x emission cap applied to non-EGU point sources in the region that is equivalent to a 55 percent reduction from uncontrolled NO_x emissions for these sources. Therefore, the control opportunities in Houston-Galveston for the local measures analysis include (1) taking major non-EGU sources to a higher level of NO_x control, (2) applying RACT-level controls to smaller NO_x sources (those emitting 25 tons per year or above), and (3) applying controls to sources outside the nonattainment area, but within a 200 km radius.

Exhibit 8-3b. Comparison of Attainment Targets with Reductions Achieved Via Local Measures in 2020

Area Name	VOC Reduction Target (tons)	VOC Reduced, Identified Measures (tons)	Remainder Unidentified Measures (tons)	NO_x Reduction Target (tons)	NO_x Reduced, Identified Measures (tons)	Remainder Unidentified Measures (tons)
Atlanta	0	3,637		6609	9,756	
Baltimore	0	13,773		31685	6,475	25,210
Buffalo	0	2,646		13551	10,784	2,767
Beaumont	0	2,984			17,543	
Chicago - Cook/Lake Cos.	31,555	25,412	6,143	22,904	33,356	
Chicago - Rest	42,331	28,113	14,218	40,539	12,285	28,254
Cleveland	0	11,911		19,111	16,893	2,218
Dallas - FT Worth	0	28,581		30,613	34,116	
Detroit	17,817	17,817		-	6,377	
Houston - Galveston	107,591	21,917	85,674	125,742	36,977	88,765
Kent and Queen Annes	0	468			36	
Milwaukee	0	10,035			8,882	
New York	264,064	107,021	157,043	180,417	21,142	159,275
Philadelphia	120,967	63,794	57,173	103,440	53,091	50,349
Providence	0	15		2668	408	2,260
Sheboygan	0	2,790		4009	4,783	
Washington	0	9,966		16446	15,383	1,063
Total		**350,881**	**320,252**		**288,287**	**360,161**

Note: In the Chicago, IL-IN 8-hour ozone nonattainment area, Cook County IL and Lake County, IN have separate attainment targets from those estimated for the remaining counties in the nonattainment area. Therefore, these two areas are shown separately in this exhibit.

Both New York and Philadelphia are in the region that is affected by the NO_x SIP Call, so those requirements provide the effective baseline for applying additional local controls in this analysis. Philadelphia makes more progress in achieving further NO_x emission reductions in 2010 than New York does largely because the Philadelphia area is able to reduce its EGU NOx emissions by about 30 thousand tons more than the New York area achieves in 2010. Non-EGU stationary source emission reductions are also slightly higher in Philadelphia than New York because the Philadelphia area has more NO_x beyond the SIP Call emission reductions available. These emission reductions are largely achieved at cement and glass manufacturing plants in the area surrounding the nonattainment area proper.

While mobile source controls applied by 2010 are able to reduce both VOC and NO_x emissions, there is less area-to-area variability in the emission reductions from this sector.

Clean Air Visibility Rule Analysis

The EPA rule aimed at addressing regional haze is commonly known as the Best Available Retrofit Technology rule, or BART rule, but will be referred to hereafter by its official EPA name: the Clean Air Visibility Rule, or CAVR (except that the widely used term “BART-eligible” will still be used herein).

The Project Team estimated the non-EGU NO_x and SO_2 emissions reductions and control costs using methods developed previously for the EPA analysis of the implementation of the CAVR. EGU emission reductions associated with CAVR are included in the core scenarios.

For the EPA analysis of the CAVR, EPA evaluated three possible scenarios of actions the states may take to comply with this rule. Of the three scenarios, this section 812 study uses the medium stringency option. The CAVR requirements of the regional haze rule apply to facilities built between 1962 and 1977 that have the potential to emit more than 250 tons per year of visibility impairing pollution. Those facilities fall into 26 categories, including utility and industrial boilers, and large industrial plants such as pulp mills, refineries and smelters. Many of these facilities have not previously been subject to federal pollution control requirements for these pollutants.

The two main data inputs used in this analysis are the 2020 control measure database developed using AirControlNET and a list of non-EGU BART-eligible sources previously developed by EPA which identify the potentially affected BART-eligible non-EGU sources. The control measure database contains a listing of control strategies and the resulting emission reductions, control costs, and annualized capital and operating and maintenance (O&M) costs at the facility-level for each control strategy.

For this analysis, the Project Team determined the NO_x and SO_2 control measure applicability, emissions reductions, and control costs for non-EGU BART-eligible sources for a scenario that limited the control set to a maximum average annualized cost of $4,000/ton. (See Pechan, 2005b). The $4,000/ton limit is the definition of the medium stringency option that was evaluated in the CAVR RIA. Note that the definition of what constitutes BART, which is determined on a case-by-case basis, could be a considerably different control level from what might be an appropriate cost per ton threshold in any nonattainment area plan. The results of this analysis are summarized in Exhibit 8-4 which shows the NO_x and SO_2 emissions reductions by State and by pollutant for 2020.

In practice, the states must consider a number of factors when determining what facilities will be covered by CAVR including: the cost of controls, the effect of controls on energy usage or any non-air quality environmental impacts, the remaining useful life of the equipment to be controlled, any existing controls in place, and the expected visibility improvement from controlling the emissions.

Exhibit 8-4. Clean Air Visibility Rule Emission Reduction Results for 2020

State	NO_x Emission Reduction (tons)	SO_2 Emission Reduction (tons)
Alabama	14,229	12,780
Arizona	-	1,286
Arkansas	-	5,740
California	3,236	10,064
Colorado	3,662	4,972
Connecticut	83	158
Delaware	405	-
Florida	8,516	16,172
Georgia	10,405	12,545
Idaho	2,030	2,955
Illinois	5,661	4,132
Indiana	9,611	10,667
Iowa	5,118	12,577
Kansas	3,479	-
Kentucky	3,584	6,521
Louisiana	57,000	21,300
Maine	6,006	7,943
Maryland	1,191	-
Massachusetts	619	1,144
Michigan	8,682	12,793
Minnesota	4,809	4,988
Mississippi	9,403	3,729
Missouri	1,623	1,720
Montana	659	-
Nebraska	436	1,332
Nevada	449	-
New Hampshire	64	744
New Jersey	525	-
New Mexico	3,286	-
New York	2,250	2,822
North Carolina	4,650	5,961
Ohio	6,955	11,374
Oklahoma	4,806	2,189
Oregon	3,320	-
Pennsylvania	4,657	74
Rhode Island	20	-
South Carolina	11,625	13,338
Tennessee	6,686	34,633
Texas	3,859	-
Washington	10,934	-
West Virginia	3,907	271
Wisconsin	1,733	20,156
Wyoming	5,460	4,209
TOTAL	**235,635**	**251,287**

$PM_{2.5}$ NAAQS Attainment Analysis

On September 8, 2005, EPA proposed requirements that State and local governments have to meet as they implement the NAAQS for $PM_{2.5}$. The implementation rule stated that nonattainment area State Implementation Plans (SIPs) should include reasonably available control measure (RACM) and RACT control programs as well as show RFP. SIPs are due in April 2008 for $PM_{2.5}$ NAAQS attainment – three years after designation. There are 39 $PM_{2.5}$ nonattainment areas. The proposed rule requires States to meet the $PM_{2.5}$ standard by 2010.

EPA's proposed implementation of the $PM_{2.5}$ NAAQS presents different options that EPA might select for identifying which $PM_{2.5}$ precursors an area might need to control, proposed options for $PM_{2.5}$ classification, as well as options for RACT, RACM, and RFP (70 FR 71612). This analysis focuses on estimating the potential emission reductions in PM precursors following EPA's preferred approach at proposal, with a few exceptions noted below. Our approach can be summarized as follows:

1. $PM_{2.5}$ precursors are SO_2 and NO_x. States are not required to address ammonia as a $PM_{2.5}$ nonattainment plan precursor unless the State or EPA makes a technical demonstration that ammonia emissions from sources in the State significantly contribute to the $PM_{2.5}$ problem. EPA proposes that States are not required to address VOCs as $PM_{2.5}$ nonattainment precursors. (No ammonia or VOC controls were included in this $PM_{2.5}$ analysis.)

2. There is no separate RACT requirement if an area can demonstrate that it will be in attainment by 2010. Extension areas (i.e., those areas that cannot demonstrate attainment by 2010) apply RACT to affected sources in return for receiving the extension. The extension could be from one to five years past 2010. EPA's own evaluation of State SIPs for compliance with the RACT and RACM requirements will include comparisons of measures considered or adopted by other States. $PM_{2.5}$ controls will focus on upgrades to existing control technologies and compliance monitoring methods. RACT determinations are needed for PM precursors (SO_2 and NO_x).

3. No cost per ton threshold is specified. (EPA's proposed implementation rule says that their preferred approach is to not specify a cost per ton threshold, which leaves areas discretion in how they might apply their own cost per ton thresholds. As a practical matter, a $10,000 per ton upper limit is applied in this analysis. This approach is consistent with prior analyses, including the first 812 Prospective Study. The approach rests on the assumption that requirements where per ton costs exceed $10,000 will motivate technological improvements or alternative or innovative measures to avoid incurring exorbitant control costs. In practice, the upper limit cost per ton threshold will differ by pollutant and geographic area according to the need to reduce certain pollutants per local source mixes and atmospheric conditions.

4. RACT controls must be in place by 2009.

5. For RACM, States are required to provide a demonstration that they have adopted all reasonably available measures needed to attain as expeditiously as practicable. Exhibit 8-5 summarizes emission reduction measures which were listed in the preamble to the proposed PM2.5 implementation rule as potential RACM measures that should be considered by states. (This analysis includes as many of the measures in Exhibit 8-5 as matches were found with measures in AirControlNET. These assignments were made based on the judgment of the Project Team.)

Exhibit 8-5. $PM_{2.5}$ Implementation Rule Emission Reduction Measures -- Potential RACM

Measures
Stationary Source Measures
Stationary diesel engine retrofit, rebuild or replacement, with catalyzed particle filter
New or upgraded emission control requirements for direct $PM_{2.5}$ emissions at stationary sources (e.g., installation or improved performance of control devices such as a baghouse or electrostatic precipitator; revised opacity standard; improved compliance monitoring methods)
New or upgraded emission controls for $PM_{2.5}$ precursors at stationary sources (e.g., SO_2 controls such as wet or dry scrubbers, or reduced sulfur content in fuel)
Energy efficiency measures to reduce fuel consumption and associated pollutant emissions (either from local sources or distant power providers)
Mobile Source Measures
Onroad diesel engine retrofits for school buses and trucks using EPA-verified technologies
Nonroad diesel engine retrofit, rebuild or replacement, with catalyzed particle filter
Diesel idling programs for trucks, locomotive, and other mobile sources
Transportation control measures (including those listed in section 108(f) of the CAA as well as other TCMs), as well as other transportation demand management and transportation systems management strategies
Programs to reduce emissions or accelerate retirement of high emitting vehicles, boats, and lawn and garden equipment
Emissions testing and repair/maintenance programs for onroad vehicles
Emissions testing and repair/maintenance programs for nonroad heavy-duty vehicles and equipment
Programs to expand use of clean burning fuels
Prohibitions on the sale and use of diesel fuel that exceeds a high sulfur content
Low emissions specifications for equipment or fuel used for large construction contracts, industrial facilities, ship yards, airports, and public or private vehicle fleets
Opacity or other emissions standards for "gross-emitting" diesel equipment or vessels
Reduce dust from paved and unpaved roads
Area Source Measures
New open burning regulations and/or measures to improve program effectiveness
Smoke management programs to minimize emissions from forest and agricultural burning activities
Programs to reduce emissions from woodstoves and fireplaces
Controls on emissions from charbroiling or other commercial cooking operations
Reduced solvent usage or solvent substitution (particularly for organic compounds with 7 carbon atoms or more, such as toluene, xylene, and trimethyl benzene)
Reduce dust from construction activities and vacant disturbed areas

EPA and States are currently working to develop a list of likely control measures anticipated for inclusion in $PM_{2.5}$ SIPs. While area-specific SIP control measures are not available for this analysis, the Project Team developed a representative model SIP control program based on available control measures in AirControlNET for primary $PM_{2.5}$, SO_2 and NO_x. This list of control measures is shown in Exhibit 8-6, which includes both RACT and RACM controls. Note that point source and EGU control measures in AirControlNET were applied only to sources with annual emissions greater than 100 tons, as suggested in the EPA proposed rule.

For this analysis, the Project Team estimated attainment costs and emissions reductions using the AirControlNET control measure dataset and applied the model control measures to sources in the nonattainment areas. The model SIP measure list was applied to all $PM_{2.5}$ nonattainment area counties, up to a maximum cost per ton of $10,000 for SO_2 and NO_x sources, as discussed above. This maximum cost per ton is applied on a source category-control measure combination basis. The cost and emissions analysis also includes estimates of the costs associated with the implementation of the mandatory control requirements in the nonattainment areas, such as NO_x RACT. Exhibits 8-7a and 8-7b provide the emission reductions by pollutant for the $PM_{2.5}$ NAAQS analysis for 2010 and 2020, respectively.

Exhibit 8-6. List of PM NAAQS Model SIP Control Measures

Source	Pollutant	Measure Name
Industrial Boilers - Coal	PM	Increased Monitoring Frequency (IMF) of PM Control
Industrial Boilers - Wood	PM	Increased Monitoring Frequency (IMF) of PM Control
Industrial Boilers - Oil	PM	Increased Monitoring Frequency (IMF) of PM Control
Commercial Institutional Boilers - Coal	PM	Increased Monitoring Frequency (IMF) of PM Control
Commercial Institutional Boilers - Wood	PM	Increased Monitoring Frequency (IMF) of PM Control
Commercial Institutional Boilers - Oil	PM	Increased Monitoring Frequency (IMF) of PM Control
Non-Ferrous Metals Processing - Copper	PM	Increased Monitoring Frequency (IMF) of PM Control
Non-Ferrous Metals Processing - Lead	PM	Increased Monitoring Frequency (IMF) of PM Control
Non-Ferrous Metals Processing - Zinc	PM	Increased Monitoring Frequency (IMF) of PM Control
Non-Ferrous Metals Processing - Aluminum	PM	Increased Monitoring Frequency (IMF) of PM Control
Non-Ferrous Metals Processing - Other	PM	Increased Monitoring Frequency (IMF) of PM Control
Ferrous Metals Processing - Coke	PM	Increased Monitoring Frequency (IMF) of PM Control
Ferrous Metals Processing - Ferroalloy Production	PM	Increased Monitoring Frequency (IMF) of PM Control
Ferrous Metals Processing - Iron & Steel Production	PM	Increased Monitoring Frequency (IMF) of PM Control
Ferrous Metals Processing - Gray Iron Foundries	PM	Increased Monitoring Frequency (IMF) of PM Control
Ferrous Metals Processing - Steel Foundries	PM	Increased Monitoring Frequency (IMF) of PM Control
Mineral Products - Cement Manufacture	PM	Increased Monitoring Frequency (IMF) of PM Control
Mineral Products - Coal Cleaning	PM	Increased Monitoring Frequency (IMF) of PM Control
Mineral Products - Stone Quarrying & Processing	PM	Increased Monitoring Frequency (IMF) of PM Control
Mineral Products - Other	PM	Increased Monitoring Frequency (IMF) of PM Control
Asphalt Manufacture	PM	Increased Monitoring Frequency (IMF) of PM Control
Chemical Manufacture	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - Coal	PM	Increased Monitoring Frequency (IMF) of PM Control
Commercial Institutional Boilers - Solid Waste	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - Coke	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - Bagasse	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - LPG	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - Liquid Waste	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - Natural Gas	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - Oil	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - Solid Waste	PM	Increased Monitoring Frequency (IMF) of PM Control
Electric Generation - Wood	PM	Increased Monitoring Frequency (IMF) of PM Control
Ferrous Metals Processing - Other	PM	Increased Monitoring Frequency (IMF) of PM Control
Industrial Boilers - Coke	PM	Increased Monitoring Frequency (IMF) of PM Control
Industrial Boilers - Solid Waste	PM	Increased Monitoring Frequency (IMF) of PM Control
Industrial Boilers - Coal	PM	CEM Upgrade and IMF of PM Controls
Industrial Boilers - Wood	PM	CEM Upgrade and IMF of PM Controls
Industrial Boilers - Oil	PM	CEM Upgrade and IMF of PM Controls

Exhibit 8-6. List of PM NAAQS Model SIP Control Measures

Source	Pollutant	Measure Name
Commercial Institutional Boilers - Coal	PM	CEM Upgrade and IMF of PM Controls
Commercial Institutional Boilers - Wood	PM	CEM Upgrade and IMF of PM Controls
Commercial Institutional Boilers - Oil	PM	CEM Upgrade and IMF of PM Controls
Non-Ferrous Metals Processing - Copper	PM	CEM Upgrade and IMF of PM Controls
Non-Ferrous Metals Processing - Lead	PM	CEM Upgrade and IMF of PM Controls
Non-Ferrous Metals Processing - Zinc	PM	CEM Upgrade and IMF of PM Controls
Non-Ferrous Metals Processing - Aluminum	PM	CEM Upgrade and IMF of PM Controls
Non-Ferrous Metals Processing - Other	PM	CEM Upgrade and IMF of PM Controls
Ferrous Metals Processing - Coke	PM	CEM Upgrade and IMF of PM Controls
Ferrous Metals Processing - Ferroalloy Production	PM	CEM Upgrade and IMF of PM Controls
Ferrous Metals Processing - Iron & Steel Production	PM	CEM Upgrade and IMF of PM Controls
Ferrous Metals Processing - Gray Iron Foundries	PM	CEM Upgrade and IMF of PM Controls
Ferrous Metals Processing - Steel Foundries	PM	CEM Upgrade and IMF of PM Controls
Mineral Products - Cement Manufacture	PM	CEM Upgrade and IMF of PM Controls
Mineral Products - Coal Cleaning	PM	CEM Upgrade and IMF of PM Controls
Mineral Products - Stone Quarrying & Processing	PM	CEM Upgrade and IMF of PM Controls
Mineral Products - Other	PM	CEM Upgrade and IMF of PM Controls
Asphalt Manufacture	PM	CEM Upgrade and IMF of PM Controls
Chemical Manufacture	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - Coal	PM	CEM Upgrade and IMF of PM Controls
Commercial Institutional Boilers - Solid Waste	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - Coke	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - Bagasse	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - LPG	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - Liquid Waste	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - Natural Gas	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - Oil	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - Solid Waste	PM	CEM Upgrade and IMF of PM Controls
Electric Generation - Wood	PM	CEM Upgrade and IMF of PM Controls
Ferrous Metals Processing - Other	PM	CEM Upgrade and IMF of PM Controls
Industrial Boilers - Coke	PM	CEM Upgrade and IMF of PM Controls
Industrial Boilers - Solid Waste	PM	CEM Upgrade and IMF of PM Controls
Agricultural Burning	PM	Bale Stack/Propane Burning
Residential Wood Combustion	PM	Education and Advisory Program
Sulfuric Acid Plants - Contact Absorber (99% Conversion)	SO2	Increase % Conversion to Meet NSPS (99.7)
Sulfuric Acid Plants - Contact Absorber (98% Conversion)	SO2	Increase % Conversion to Meet NSPS (99.7)
Sulfuric Acid Plants - Contact Absorber (97% Conversion)	SO2	Increase % Conversion to Meet NSPS (99.7)
Sulfuric Acid Plants - Contact Absorber (93% Conversion)	SO2	Increase % Conversion to Meet NSPS (99.7)

Exhibit 8-6. List of PM NAAQS Model SIP Control Measures

Source	Pollutant	Measure Name
Sulfur Recovery Plants - Elemental Sulfur (Claus: 2 Stage w/o control (92-95% removal))	SO2	Amine Scrubbing
Sulfur Recovery Plants - Elemental Sulfur (Claus: 2 Stage w/o control (92-95% removal))	SO2	Sulfur Recovery and/or Tail Gas treatment
Sulfur Recovery Plants - Elemental Sulfur (Claus: 3 Stage w/o control (95-96% removal))	SO2	Amine Scrubbing
Sulfur Recovery Plants - Elemental Sulfur (Claus: 3 Stage w/o control (95-96% removal))	SO2	Sulfur Recovery and/or Tail Gas treatment
Sulfur Recovery Plants - Elemental Sulfur (Claus: 4 Stage w/o control (96-97% removal))	SO2	Amine Scrubbing
Sulfur Recovery Plants - Elemental Sulfur (Claus: 3 Stage w/o control (96-97% removal))	SO2	Sulfur Recovery and/or Tail Gas treatment
Inorganic Chemical Manufacture	SO2	FGD
By-Product Coke Manufacturing (Coke Oven Plants)	SO2	Coke Oven Gas Desulfurization
Process Heaters (Oil and Gas Production Industry)	SO2	FGD
Primary Metals Industry	SO2	Sulfuric Acid Plant
Secondary Metal Production	SO2	FGD
Mineral Products Industry	SO2	FGD
Pulp and Paper Industry (Sulfate Pulping)	SO2	FGD
Petroleum Industry	SO2	FGD
Bituminous/Subbituminous Coal (Industrial Boilers)	SO2	FGD
Residual Oil (Industrial Boilers)	SO2	FGD
Bituminous/Subbituminous Coal (Commercial/Institutional Boilers)	SO2	FGD
In-process Fuel Use - Bituminous/Subbituminous Coal	SO2	FGD
Lignite (Industrial Boilers)	SO2	FGD
Residual Oil (Commercial/Institutional Boilers)	SO2	FGD
Steam Generating Unit-Coal/Oil	SO2	FGD
Primary Lead Smelters - Sintering	SO2	Dual absorption
Primary Zinc Smelters - Sintering	SO2	Dual absorption
Bituminous/Subbituminous Coal (Industrial Boilers)	SO2	IDIS
Bituminous/Subbituminous Coal (Industrial Boilers)	SO2	SDA
Bituminous/Subbituminous Coal (Industrial Boilers)	SO2	Wet FGD
Lignite (Industrial Boilers)	SO2	IDIS
Lignite (Industrial Boilers)	SO2	SDA
Lignite (Industrial Boilers)	SO2	Wet FGD
Residual Oil (Industrial Boilers)	SO2	Wet FGD
Residential Wood Combustion	PM	NSPS Compliant Wood Stove
Conveyorized Charbroilers	PM	Catalytic Oxidizer
Highway Vehicles - Gasoline	NOX	I/M - OBD Based for Section 812
Highway Vehicles - Heavy Duty Diesel Engines	NOX	Voluntary Diesel Retrofit Program: Section 812
Highway Vehicles - Heavy Duty Diesel Engines	PM	Onroad Retrofit/Scrappage
Highway Vehicles - Heavy Duty Diesel Engines	PM	Eliminate Long Duration Diesel Idling
Off-Highway Diesel Vehicles	PM	Off-Highway Diesel Engine Retrofit

Exhibit 8-7a. $PM_{2.5}$ NAAQS Attainment Emission Reduction Results for 2010

	SO_2 Emission Reduction (tons)	NO_x Emission Reduction (tons)					$PM_{2.5}$ Emission Reduction (tons)				
Area Name	**Point**	**EGU**	**Point**	**Nonpoint**	**Onroad**	**Nonroad**	**EGU**	**Point**	**Nonpoint**	**Onroad**	**Nonroad**
Atlanta, GA	2,190	-	909	-	-	362	1,403	-	9	-	73
Baltimore, MD	-	-	1,034	-	425	106	341	-	-	93	21
Birmingham, AL	1,904	-	2,441	-	1,628	52	742	-	14	43	11
Canton-Massillon, OH	539	-	-	-	482	10	-	-	-	12	2
Charleston, WV	2,099	-	1,532	-	429	-	341	-	10	12	-
Chattanooga, AL-TN-GA	1,286	-	698	-	612	-	136	-	-	13	-
Chicago-Gary-Lake County, IL-IN	6,203	-	5,117	-	-	1,127	220	-	149	-	209
Cincinnati-Hamilton, OH-KY-IN	9,525	-	2,085	-	889	117	801	-	-	63	23
Cleveland-Akron-Lorain, OH	11,798	-	330	-	1,231	306	280	-	-	89	50
Columbus, OH	114	-	184	-	745	196	171	-	-	55	39
Dayton-Springfield, OH	2,031	-	1,187	-	542	78	51	-	-	29	14
Detroit-Ann Arbor, MI	5,982	-	2,798	-	2,176	374	923	-	-	160	74
Evansville, IN	-	-	-	-	-	68	963	-	-	-	12
Greensboro-Winston Salem-High Point, NC	-	-	146	-	402	63	-	-	123	30	14
Harrisburg-Lebanon-Carlisle, PA	-	-	-	-	144	26	-	-	-	32	4
Hickory, NC	-	-	-	-	119	-	295	-	-	8	-
Huntington-Ashland, WV-KY-OH	359	-	949	-	494	-	1,058	-	-	15	-
Indianapolis, IN	-	-	-	-	-	162	347	-	-	-	31
Johnstown, PA	-	-	-	-	202	-	353	-	10	9	-
Knoxville, TN	5,224	-	125	-	581	8	451	-	-	35	1
Lancaster, PA	-	-	-	-	95	31	-	-	-	22	5
Libby, MT	-	-	-	-	18	-	-	-	-	1	-
Liberty-Clairton, PA	455	-	147	-	436	167	48	-	13	32	35
Los Angeles-South Coast Air Basin, CA	-	-	4,026	-	6,839	2,287	-	-	1,469	390	465
Louisville, KY-IN	2,153	-	1,003	-	463	69	596	-	15	27	15
Macon, GA	582	-	397	-	-	-	329	-	-	-	-
Martinsburg, WV-Hagerstown, MD	-	-	1,244	-	241	-	-	-	-	17	-
New York-N. New Jersey-Long Island,NY-NJ-CT	549	-	518	-	2,212	2,157	320	-	231	397	445
Parkersburg-Marietta, WV-OH	5,916	-	580	-	243	-	233	-	-	6	-
Philadelphia-Wilmington, PA-NJ-DE	12,126	-	563	-	575	270	137	-	21	125	53
Pittsburgh-Beaver Valley, PA	5,916	-	1,876	-	1,064	41	883	-	10	51	8
Reading, PA	-	-	583	-	75	18	77	-	-	17	3
Rome, GA	4,129	-	1,450	-	-	-	150	-	-	-	-
San Joaquin Valley, CA	255	-	2,883	-	2,492	638	-	-	3,721	159	110
St. Louis, MO-IL	6,969	-	1,965	-	1,047	271	1,067	-	42	76	52
Steubenville-Weirton, OH-WV	311	-	851	-	110	-	524	-	-	3	-
Washington, DC-MD-VA	-	-	367	-	863	358	219	-	13	106	74
Wheeling, WV-OH	18,887	-	757	-	230	-	267	-	-	7	-
York, PA	6,752	-	531	-	77	26	324	-	-	18	4
TOTAL	**114,253**	**-**	**39,278**	**-**	**28,180**	**9,388**	**14,048**	**-**	**5,849**	**2,152**	**1,847**

Exhibit 8-7b. PM2.5 NAAQS Attainment Emission Reduction Results for 2020

	SO_2 Emission Reduction (tons)	NO_x Emission Reduction (tons)					$PM_{2.5}$ Emission Reduction (tons)				
Area Name	**Point**	**EGU**	**Point**	**Nonpoint**	**Onroad**	**Nonroad**	**EGU**	**Point**	**Nonpoint**	**Onroad**	**Nonroad**
Atlanta, GA	2,259	-	564	-	-	85	782	-	-	-	20
Baltimore, MD	-	-	1,148	-	114	18	184	-	-	25	6
Birmingham, AL	3,015	-	2,712	-	1,423	11	531	-	11	11	2
Canton-Massillon, OH	328	-	-	-	417	-	-	-	-	3	-
Charleston, WV	2,068	-	1,662	-	284	-	316	-	-	2	-
Chattanooga, AL-TN-GA	1,253	-	589	-	537	-	144	-	-	3	-
Chicago-Gary-Lake County, IL-IN	1,953	-	5,559	-	-	338	222	-	161	-	65
Cincinnati-Hamilton, OH-KY-IN	8,125	-	1,911	-	99	10	642	-	-	16	2
Cleveland-Akron-Lorain, OH	10,273	-	298	-	133	90	223	-	-	22	14
Columbus, OH	100	-	256	-	85	58	190	-	-	14	13
Dayton-Springfield, OH	1,769	-	1,185	-	223	17	51	-	-	7	2
Detroit-Ann Arbor, MI	6,106	-	3,041	-	246	94	785	-	-	41	22
Evansville, IN	-	-	-	-	-	25	861	-	-	-	4
Greensboro-Winston Salem-High Point, NC	-	-	149	-	48	7	-	-	137	8	1
Harrisburg-Lebanon-Carlisle, PA	-	-	-	-	37	-	-	-	-	7	-
Hickory, NC	-	-	-	-	13	-	179	-	-	2	-
Huntington-Ashland, WV-KY-OH	242	-	1,030	-	164	-	930	-	-	2	-
Indianapolis, IN	-	-	-	-	-	41	261	-	-	-	9
Johnstown, PA	-	-	-	-	56	-	346	-	-	2	-
Knoxville, TN	5,164	-	189	-	101	-	183	-	-	9	-
Lancaster, PA	-	-	-	-	26	13	-	-	-	6	2
Liberty-Clairton, PA	403	-	157	-	50	40	48	-	10	8	12
Los Angeles-South Coast Air Basin, CA	-	-	4,592	-	1,334	827	-	-	1,625	222	199
Louisville, KY-IN	2,187	-	1,078	-	175	7	626	-	63	7	1
Macon, GA	573	-	422	-	-	-	329	-	-	-	-
Martinsburg, WV-Hagerstown, MD	-	-	1,370	-	171	-	-	-	-	4	-
New York-N. New Jersey-Long Island,NY-NJ-CT	583	-	558	-	1,033	529	276	-	216	103	132
Parkersburg-Marietta, WV-OH	5,827	-	546	-	136	-	233	-	-	2	-
Philadelphia-Wilmington, PA-NJ-DE	13,656	-	613	-	148	33	139	-	8	32	9
Pittsburgh-Beaver Valley, PA	6,079	-	2,011	-	510	4	486	-	-	12	1
Reading, PA	-	-	638	-	20	8	77	-	-	5	1
Rome, GA	4,103	-	1,508	-	-	-	77	-	-	-	-
San Joaquin Valley, CA	466	-	3,358	-	477	259	-	-	4,337	84	42
St. Louis, MO-IL	6,880	-	2,136	-	116	88	1,069	-	87	19	17
Steubenville-Weirton, OH-WV	141	-	980	-	36	-	457	-	-	-	-
Washington, DC-MD-VA	-	-	453	-	149	54	220	-	11	29	12
Wheeling, WV-OH	19,871	-	753	-	130	-	271	-	-	1	-
York, PA	5,981	-	500	-	21	8	118	-	-	5	1
TOTAL	**109,406**	**-**	**41,964**	**-**	**8,515**	**2,663**	**11,258**	**-**	**6,667**	**711**	**592**

Exhibits 8-7a and 8-7b also display the $PM_{2.5}$ NAAQS emission reduction results by nonattainment area. It shows that SO_2 emission reductions result from applying RACT-level controls to non-EGU point sources. The nonpoint source sector is unaffected because sources classified as nonpoint should be below the 100 ton per year RACT threshold (i.e., these are small point sources to which RACT or RACM controls are unlikely to be applied). Further controls are not applied to onroad and nonroad engines and vehicles because fuel sulfur limits have reduced these sector's SO_2 emissions to levels where further controls are not likely to be cost competitive with point source controls.

For $NO_{x,}$ no additional emission reductions are applied to EGUs in the $PM_{2.5}$ NAAQS analysis because it is expected that NO_x RACT is already being met by EGUs. However, NO_x RACT is applied to non-EGU point sources in areas that do not already have NOx RACT requirements. NO_x emission reductions observed for onroad vehicles in the $PM_{2.5}$ NAAQS analysis are usually attributable to measures selected to retrofit heavy-duty diesel engines and to reduce long duration diesel idling. Similarly, nonroad engine/vehicle associated emission reductions are for off-highway diesel engine retrofits.

$PM_{2.5}$ emission reductions for EGUs are usually related to adoption of control equipment efficiency improvements that are occurring because sources with ESPs or fabric filters are increasing the frequency of compliance monitoring or otherwise taking steps to improve the collection efficiency of their PM controls in place. Nonpoint source $PM_{2.5}$ emission reductions come from measures to increase the market share of New Source Performance Standard (NSPS) compliant wood stoves in residences. Onroad and nonroad engine/vehicle retrofit programs provide most of the $PM_{2.5}$ emission reductions observed for those sectors.

Note that this analysis was performed by defining nonattainment areas using county boundaries, because that is the way that the emission databases are organized. Some nonattainment areas include partial counties. If part of a county is in a nonattainment area, and the remainder of the county is in attainment, then the entire county is counted as part of the nonattainment area. If a county is part of two or more different nonattainment areas, then its emissions are assigned to the nonattainment area with the most severe nonattainment designation. As a result of the above, some $PM_{2.5}$ nonattainment areas do not show up in the results exhibit. For example, Riverside County, CA, is in three different $PM_{2.5}$ nonattainment areas. For this analysis, all of Riverside County's emissions are accounted for in the South Coast Air Basin nonattainment area.

Reductions associated with the $PM_{2.5}$ model SIP differ between 2010 and 2020 for two reasons. First, the 2020 case has CAVR-associated emission reductions applied prior to the emission reductions associated with $PM_{2.5}$ RACT and RACM. This leads to smaller NO_x and SO_2 emission reductions attributable to the model SIP in 2020. Second, the 2020 baseline differs from the 2010 baseline, primarily because of changes in economic activity and pollution control programs over this ten year period.

Exhibit 8-8 summarizes the national emission reductions associated with the 8-hour ozone NAAQS implementation, the CAVR rule, and the $PM_{2.5}$ NAAQS by pollutant.

Exhibit 8-8a. 2010 Local Measures Analysis Summary National Emission Reductions by Pollutant (tons)

	VOC	NO_x	SO_2	$PM_{2.5}$
8-Hour Ozone NAAQS	369,497	347,651	0	0
CAVR	0	0	0	0
PM-2.5 NAAQS	0	76,846	114,253	9,848
Total	**369,497**	**424,497**	**114,253**	**9,848**

Exhibit 8-8b. 2020 Local Measures Analysis Summary National Emission Reductions by Pollutant (tons)

	VOC	NO_x	SO_2	$PM_{2.5}$
8-Hour Ozone NAAQS	410,997	309,291	0	0
CAVR	0	235,635	251,287	0
PM-2.5 NAAQS	0	53,142	109,406	7,920
Total	**410,997**	**598,068**	**360,693**	**7,920**

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Pechan, 2005a. "Potential Impacts of Implementation of the 8-Hour Ozone NAAQS - Technical Support Document," prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, July 2005.

Pechan, 2005b. "National Estimates of the Emission Reductions and Costs of Best Available Retrofit Technology (BART) Implementation Using AirControlNET - Technical Support Analysis", prepared for U.S. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, NC, April 2005.