Supplemental Air Quality Modeling Technical Support Document (TSD) for the Clean Air Interstate Rule (CAIR), May, 2004.

I. Introduction

This document provides additional background and analyses supporting EPA's proposed determination that compliance with the proposed CAIR, if achieved by power plants under the model cap-and-trade programs, would satisfy the best available retrofit technology (BART) requirements for those sources as a "better than BART" alternative. Section III.E of the supplemental proposal (SNPR) of the Clean Air Interstate Rule (CAIR) discusses this proposed determination. The EPA's supporting assessment is consistent with the requirements established under the regional haze rule (64 FR 3714, July 1, 1999), and under the proposed Guidelines for Best Available Retrofit Technology (BART) Determinations (66 FR 38108, July 20, 2001, and 69 FR 25184, May 5, 2004). Section II of this document discusses and compares the emissions projections for reductions expected under the proposed CAIR and under the BART requirements. Section III of this document explains the projections of visibility impacts at Class I areas used to support the "better than BART" determination in the CAIR proposed rule.

II. Emissions Projections Used for CAIR Analysis

A. Overview of Emission Projections

As discussed in the SNPR preamble, in performing the "Better-than-BART" analysis we would ideally use air quality modeling based on emissions projections for the scenario where the proposed CAIR is in effect only in the proposed CAIR region and source-specific BART is in effect in the rest of the country.[1] We would compare the visibility impacts of this scenario to existing visibility conditions to determine whether the proposed CAIR resulted in a degradation of visibility at any Class I area. We would also compare these visibility impacts with the visibility impacts of nationwide BART implementation, to assess whether the proposed CAIR would result in greater average visibility improvement than nationwide BART. These comparisons should be made for the year in which source-specific BART would be fully implemented (2014).

As noted in the SNPR preamble, currently available modeling runs approximated, but did not exactly match the scenarios described above. Specifically, emissions projections for BART are currently available only on a nationwide basis, and only for EGUs larger than 250 MW. The available emissions projections reflecting implementation of the proposed CAIR are based on nationwide SO2[2] and 32[3] state NOx emissions reduction requirements for all EGUs, without

[1] As discussed in the SNPR preamble, we applied the two-pronged visibility test, rather than the simpler overall emissions reductions test, because our modeling showed a potential for a different geographic distribution of emissions reductions under the proposed CAIR cap and trade program than under source-specific BART.

[2] SO2 emissions for this modeling were based on a 2.86:1 retirement ratio of Title IV allowances.

[3] 31 entire states and a portion of one state (eastern Texas).

BART being in effect outside the proposed CAIR region.

We believe that, despite the differences in the geographic scope of the proposed CAIR emission reductions requirements as modeled and as proposed, our CAIR modeling reasonably approximates the expected emissions under the proposed CAIR. Similarly, we believe that the emissions projections we used to represent BART implementation reasonably approximate emissions under BART as ideally modeled. The rest of this section summarizes the emissions projections that EPA used in this analysis; explains why EPA believes that they represent reasonable approximations of the ideal scenarios; and explains qualitatively what EPA believes would be the impact of further refining the emissions projections.

B. CAIR EGU Emissions Projections

EGU emissions were projected using the Integrated Planning Model. A full description of the Integrated Planning Model as well as the assumptions for the Base Case can be found at: http://www.epa.gov/airmarkets/epa-ipm/ . The emissions projections for the proposed CAIR were described in the January 2004 CAIR analysis. In that analysis, EPA analysts simulated nationwide cap on SO2 emissions and a 32 State regionwide cap on NOx emissions.By contrast, the CAIR as proposed would achieve SO2 emission reductions in an eastern region of 28 States and the District of Columbia, rather than nationwide. Similarly, while the proposed CAIR would achieve NOx reductions in 29 States and the District of Columbia, the modeling scenarios EPA analyzed also included NOx reductions in Vermont, New Hampshire, Maine and Rhode Island, which were not required under the proposed CAIR. Conversely, NOx reductions in Kansas and the western half of Texas are required by the CAIR proposal but were not included in the CAIRscenario as modeled.

However, as noted in the January 30, 2004 notice of proposed rulemaking (NPRM), and illustrated further in the tables below, the SO_2 and NOx reduction requirements simulated in this analysis provide a very close estimate to the reductions that would be expected under the CAIR as proposed.

The State-by-State emissions under the base case and the proposed CAIR as analyzed are presented in Table 1 below. Table 2 summarizes total emissions in proposed CAIR and Non-CAIR States under the base case and under the proposed CAIR, and shows the resulting emission reductions expected under the proposed CAIR in each region.

Table II-1: Projected 2015 EGU Emissions under Base Case and CAIR (as analyzed)[4] (1000 tons)

CAIR-region State	Base Case		"CAIR"	
	SO_2	NOx	SO_2	NOx
Alabama	416	129	334	59
Arkansas	123	53	78	9
Connecticut†	6	5	5	5
Delaware	48	11	35	9
District Of Columbia	0	0	0	0
Florida	230	171	174	54
Georgia	600	153	197	52
Illinois	534	179	258	95
Indiana	523	242	327	74
Iowa	160	87	146	35
Kansas*	65	102	60	101
Kentucky	357	199	282	53
Louisiana	113	50	80	15
Maryland	230	62	40	25
Massachusetts	16	12	10	11
Michigan	384	126	379	94
Minnesota	87	105	73	42
Mississippi	74	45	43	15
Missouri	307	141	279	69
New Jersey	38	30	20	14
New York	197	66	101	53
North Carolina	141	62	141	54
Ohio	1,025	256	290	97
Pennsylvania	806	213	170	77
South Carolina	196	66	145	31
Tennessee	310	103	192	32
Texas*	487	200	365	159
Virginia	185	57	116	33
West Virginia	485	148	139	36
Wisconsin	176	97	168	56
Total	8,319	3,169	4,646	1,457

Non-CAIR region State	Base Case		"CAIR"	
	SO_2	NOx	SO_2	NOx
Arizona	47.8	86.0	47.8	85.8
California	10.7	17.8	10.7	17.8
Colorado	70.4	81.0	70.4	81.0
Idaho	-	1.2	-	1.2
Maine††	2.6	1.9	2.6	1.9
Montana	17.7	38.5	17.0	38.5
Nebraska	96.3	56.6	96.3	56.8
Nevada	17.3	40.7	17.5	41.1
New Hampshire††	7.3	3.8	5.6	3.1
New Mexico	48.2	76.1	48.2	76.3
North Dakota**	171.2	80.2	67.2	84.5
Oklahoma	133.0	86.6	131.9	87.2
Oregon	15.2	13.5	15.2	13.5
Rhode Island††	-	2.0	-	2.0
South Dakota**	41.5	12.3	2.2	16.4
Utah	31.4	69.2	31.4	69.2
Vermont††	-	-	-	-
Washington	5.4	25.5	5.4	25.4
Wyoming	46.0	89.0	44.5	89.0
Total	762.0	781.9	613.9	790.7

* modeling of the NOx cap did not include Kansas and the Western half of Texas

**Modeling the CAIR rule as actually proposed would not likely show significant SO_2 reductions in North Dakota and South Dakota, because they would not be within the CAIR region.

†Connecticut is required under the proposed CAIR to control NOx in the summertime

†† Our CAIR modeling included NOx emission reduction requirements for ME, NH, RI, and VT which are not required by the CAIR proposal.

[4] The scenario we used to represent the CAIR differed slightly from the actual CAIR proposal, as explained in the text and noted in the Table notes above.

Table II-2. Summary of Projected 2015 SO_2 and NOx Emissions Totals in proposed CAIR and non-CAIR States under the CAIR as analyzed [5] (1000 tons).

	Base Case		CAIR as analyzed		Emission Reductions (Base Case – CAIR)	
	SO_2	NOx	SO_2	NOx	SO_2	NOx
Total in CAIR States	8,319	3,169	4,646	1,457	3,673	1,712
Total in non-CAIR states	762	782	614	791	148	– 9
			Total Reductions		3,821	1,704

When we compare the total emissions after proposed CAIR implementation to the baseline, both in the non-CAIR States and in the CAIR states, we note that of the 3,822,000 tons of SO_2 reductions, only 149,000 tons of reductions, or less than 4%, occurred in non-CAIR states. For NOx, all of the reductions occurred in the CAIR States, with a 9,000 ton increase in non-CAIR states (about 1% over base case). Because these differences are small relative to the overall reductions, they do not affect the validity of the Better-than-BART analysis.

C. BART EGU Emissions Projections

BART is applicable to all fossil-fuel fired steam electric plants that have the potential to emit more than 250 tons of any pollutant contributing to regional haze, that were not in operation by August 7, 1962, and for which construction began by August 7, 1977. (BART also applies to 25 other source categories, but our analysis considered only EGUs, because only EGUs are eligible for participation in the proposed base CAIR model cap and trade program).

[5] As explained in text and noted in Table 1, the assumptions in the CAIR as analyzed differed slightly from CAIR as proposed.

Table II-3: State-by-state EGU Emissions Projections under BART (as analyzed)[6] in 2015 (1000 tons).

CAIR-Region State	2015EGU Emissions Under "BART"		Non-CAIR Region State	2015 EGU Emissions Under "BART"	
	SO_2	NOx		SO_2	NOx
Alabama	371	89	Arizona	47.8	86.2
Arkansas	31	36	California	17.3	19.6
Connecticut	3	5	Colorado	49.0	64.3
Delaware	52	10	Idaho	-	1.2
District Of Columbia	-	0	Maine	3.2	2.1
Florida	194	144	Montana	21.8	38.5
Georgia	224	41	Nebraska	69.0	44.4
Illinois	317	112	Nevada	17.1	30.2
Indiana	579	148	New Hampshire	8.8	3.9
Iowa	185	81	New Mexico	48.6	76.5
			North Dakota	118.4	49.7
Kansas	70	56	Oklahoma	42.2	57.9
Kentucky	346	99	Oregon	15.2	13.5
Louisiana	72	43	Rhode Island	-	2.0
Maryland	144	27	South Dakota	5.6	4.7
Massachusetts	17	12	Utah	31.5	69.4
Michigan	182	103	Vermont	-	0.0
Minnesota	91	77	Washington	6.0	16.1
Mississippi	94	36	Wyoming	50.0	90.5
Missouri	158	110	Total	551.5	670.7
New Jersey	61	14			
New York	227	63			
North Carolina	146	64			
Ohio	948	138			
Pennsylvania	396	110			
South Carolina	167	37			
Tennessee	418	53			
Texas	343	204			
Virginia	141	40			
West Virginia	323	65			
Wisconsin	162	95			
Total	6,460	2,110			

*Connecticut is a CAIR region state for purposes of summertime NOx only

The BART emissions projections used in the "better than BART" analysis were developed for EPA's April, 15, 2004 BART proposal. The modeling of EGUs for that rule included controls on BART-eligible EGUs larger than 250 MW. There are 302 BART-eligible units of greater than 250 MW, as listed in Table A-1 in the Appendix, that emit about 85% of both the SO_2 and the NOx emitted by all BART eligible EGUs. The EPA's modeling of the BART proposal projects emissions reductions of approximately 3.2 million tons of SO_2 and 1.2 million tons of NOx in 2015 from these larger EGUs. However, States would also be required

[6] BART control assumptions were applied only to BART-eligible EGUs larger than 250MW, as explained in text.

to make BART determinations for BART eligible units smaller than 250 MW. Therefore, it is likely that the BART rule would actually achieve greater reductions than currently modeled, although it is uncertain as to the extent of reductions achievable from these smaller EGUs.

We can gain an idea of the upper bound of potential reductions if all of the smaller EGUs install BART. Nationwide there are between 130 and 166 units that are of a size between 25 MW and 250 MW in size that would otherwise meet the BART criteria[7]. In 2001 these units emitted between 742,000 and 806,000 tons of SO2 and between 287,000 and 341,000 tons of NOx. These emissions provide an upper bound to the amount of emissions reductions possible from these units under BART, if one assumed that all of the units were reduced to zero.

For this analysis, we used a modeling scenario for CAIR that does not reflect the effect of BART requirements in the western States. As a result, we believe the results suggesting a small difference in visibility improvements between the BART and CAIR scenarios in visibility improvement in a few Class I areas is an artifact of the available emissions scenarios used for modeling and does not accurately reflect the effect of the combination of CAIR coupled with the BART requirements in western States. We will develop this more accurate modeling scenario when we redo the air quality modeling in developing a final rule.

Table 4 shows how these emissions are distributed between CAIR and non-CAIR States. As can be seen, the large portion of these emissions are from units located in the CAIR region.

Table II-4: SO_2 and NOx emissions from BART eligible EGUs between 25 MW and 250 MW (1,000 tons)

Area	NOx	SO_2
CAIR Region	228 to 265	647 to 694
non-CAIR Region	59 to 76	96 to 112
Total	287 to 341	742 to 807

Source: Acid Rain Database

As discussed in the SNPR preamble, for SO_2 the proposed CAIR would achieve 1.6 million tons more reductions than BART in 2015, and 2.6 million tons more by 2020. For NOx, the proposed CAIR would result in about 500,000 tons more emissions reductions than BART in both 2015 and 2020. These differences are about twice the level of total emissions from the BART-eligible EGUs of 25-250 MW. Therefore, even if all SO_2 and NOx emissions from BART-eligible EGUs between 25 and 250 MW were to be reduced to zero, the proposed CAIR would still result in about 800,000 to 1.6 million tons more SO_2 reductions, and about 250,000

[7] The range reflects different assumptions regarding the BART eligibility of units with on-line dates after 1977. The higher number of units reflects the inclusion of all coal units that went on line through 1985. The lower number reflects only units that came on-line through 1977. BART only applies to those units that began actual construction before August 7, 1977. We utilized a range because without an extensive review of permitting and construction history, it is not apparent when many potentially BART-eligible sources commenced construction. States are currently engaged in such a review.

tons more NOx reductions, than source-specific BART.

D. Comparing BART and CAIR Projections

1. Year of CAIR-to-BART Comparison

The better-than-BART analysis is based on emissions projections for the year 2015, because that is the year for which the air quality modeling was performed indeveloping the CAIR proposal. This year occurs when the projected difference between the proposed CAIR emissions and the BART emissions are near their minimum. Emissions reductions from the proposed CAIR are projected to be greater than for a national BART strategy in all other years, except for 2014. Since BART does not require or provide incentives for reductions before 2014, or 2013 at the earliest[8], the proposed CAIR is expected to show greater emissions reductions than the BART requirements in the years leading up to full implementation of the BART requiements. Similarly, emissions in the BART case will grow after 2015 with the growth of the EGU sector (and lack of cap), while they would be expected to decline after 2015 in the CAIR case, and continue to be constrained by the cap in future years under proposed CAIR. In 2014, the likely first year of the BART program, emissions for the two programs should be similar to the emissions EPA is projecting for 2015.

2. Effect of not including BART (outside the CAIR region) in the CAIR emissions projections

Because SO_2 reductions under BART in the non-CAIR states were greater (by about 65,000 tons) than the modeled reductions for the proposed CAIR in those same states,[9] we note that EPA's proposed policy approach – CAIR combined with BART in the non-CAIR region – would lead to greater reductions than was modeled for the proposed CAIR by itself.

With respect to NOx, our modeling of emissions reductios from the proposed CAIR included reductions in areas not actually covered by the CAIR proposal (VT, NH, ME, RH). However, as can be seen in Table II-1, total NOx emissions for these four states are very small (7,700 tons total or 1% of base case NOx emissions for all non-CAIR states) and our CAIR modeling projected only 700 tons of emissions reductions from this level (all from NH). Our modeling of CAIR emissions reductions also excluded some areas that are covered by the CAIR proposal (KS, west TX). When we include the proposed CAIR NOx emission reduction requirements for KS and west TX, we anticipate that the additional NOx reductions from these states will be greater than the reductions from the four New England states, which were

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[8] States that develop a trading program or other measures in lieu of BART have until 2018 to fully implement the program. However, our better-than-BART analysis compares CAIR to source-specific BART, not to yet-to-be developed trading or other alternatives. If in fact some states opt for cap and trade programs or other alternatives in lieu of BART, on a 2018 schedule, BART reductions would be even further into the future than CAIR reductions.

[9] Total SO_2 emissions for non-CAIR states are 571,100 tons under the proposed CAIR (see Table II-1) and 506,200 tons under BART (see Table II-3). The difference is 64,800 tons.

incorrectly attributed to the CAIR in our modeling.

Aside from these differences in the region where NOx emissions were modeled, the CAIR modeling understated expected NOx reductions on a national basis since it did not reflect any NOx reductions outside of the 32 state region. In fact, eligible units in those states would be required to reduce emissions under BART. Therefore, as with SO_2, we note that implementation of the proposed CAIR, in conjunction with BART in the non-CAIR region, will lead to greater nationwide emissions reductions than implementation of BART nationally.

As explained in section III below, the visibility projections based on CAIR alone – without BART implementation in the non-CAIR region – satisfy the better-than-BART test. Inclusion of BART reductions in the non-CAIR region would only increase emissions reductions and result in greater visibility improvement. Therefore, the lack of western (non-CAIR region) BART emissions reductions in our CAIR-scenario projections does not affect the better-than-BART conclusions.

III. Air Quality Analysis

A. Air quality modeling to determine future visibility

Introduction

In this section we describe the photochemical air quality modeling performed to support the proposed finding in the CAIR supplemental proposal that compliance with the proposed CAIR model trading rule by BART-eligible sources would result in greater visibility improvement that source-specific BART..

This section also includes technical information on the air quality model applied in support of the supplemental proposed rule, and the procedures for projecting regional haze for future year scenarios. The IAQR Air Quality Modeling Technical Support Document (NPR-AQMTSD)[10] contains more detailed information on the air quality modeling aspects of this rule. This technical support document provides additional information, including further details on the postprocessing of model results and calculation of visibility and visibility metrics.

1. Overview of the Modeling Process

We completed numerous modeling runs and postprocessing calculations to determine the impacts of emissions and emissions control strategies on visibility in Class I areas. Determining such visibility impacts allows comparison of the effects of compliance with BART compared with compliance with the proposed CAIR model rule. We detail these calculations and the modeling process in subsequent sections, following a brief description of the overall process.

The cornerstone of our modeling process was the development of the 2015 base case,

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[10] U.S. EPA, Technical Support Document for the Interstate Air Quality Rule - Air Quality Modeling Analyses. January 2004. Docket number OAR-2003-0053-0162.

which contains emissions for 2015 based on predicted growth and existing emissions controls. We used modeled PM concentrations to estimate visibility impairment at Class I areas. We then used the model-predicted changes in visibility impairment along with the observed current visibility values to estimate future visibility impairment at each Class I area. We applied the relative predicted changes in visibility (expressed as a percent) from the model, due to emissions changes, to the current visibility values to estimate future visibility. The projected visibility values were based on emissions changes between the 2001 "proxy" inventory and the 2015 inventory.

After we established the future year base case visibility values, we calculated estimated visibility improvements at each Class I area by modeling the CAIR control strategy as well as the BART strategy in 2015.

2. Methodology

In general, we estimated base and future year visibility impairment using the same modeling approach that was used in the January 2004 proposal to develop base and future year predictions of $PM_{2.5}$ values. As in the January 2004 proposal, we used the REMSAD model to predict base and future $PM_{2.5}$ levels. We used the REMSAD predicted $PM_{2.5}$ components to estimate future year changes in visibility at Class I areas. Details of the application of REMSAD, including model performance, can be found in the NPR-AQMTSD. That modeling approach is described in detail in the January 2004 proposal preamble, 64 FR 4593-4596, 4607-4609, 4635-4639 (January 30, 2004) and the NPR-AQMTSD (pp. 10-22, 37-42, and 57-63) and familiarity with that detailed description is assumed for present purposes.

As described in the NPR-AQMTSD, we performed a 1996 Base Year simulation to examine the ability of the modeling system to replicate observed concentrations of PM and its precursors. We then performed simulations using a 2001 "proxy" emissions inventory. The 2001 "proxy" inventory was created for the purpose of modeling 2001, which represents the most recent year for which modeling is practicable. We followed the 2001 modeling with a simulation for a future-year base case scenario for 2015. The future-year base case scenario included emissions resulting from growth and emissions controls required under Federal and State law. We then quantified the impacts of the CAIR and BART controls on visibility impairment by comparing the results of the current base case and future-year base case model runs with the results of the CAIR and BART control strategy model runs.

We quantified visibility impacts in this manner at the 44 Class I areas for which ambient $PM_{2.5}$ data for 1996 exists. Since the base year meteorology used in the REMSAD modeling is from 1996, ambient data from 1996 is needed to be able to apply the model results. It is necessary to know which days make up the 20 percent best and worst days so that the model outputs can be calculated on the same days. For a Class I area without ambient data in 1996, there is no way to match up the model predicted changes in visibility with the ambient data from the 20 percent best and worst days. There are currently 110 IMPROVE monitoring sites collecting ambient PM2.5 data at Class I areas, but only 44 of these sites have complete data for 1996.

These 44 sites are scattered throughout the country and represent all of the IMPROVE defined regional visibility areas[11] except the Boundary Waters (Northern Great Lakes) region. Of the 44 sites, 15 are in the East[12] and 29 are in the West, where the bulk of the Class I areas are located.

3. Calculation of Base Year (Current) Visibility Levels

Base year (current) visibility values at Class I areas were needed to determine the starting point for calculating future year visibility improvements. For the purpose of evaluating visibility for the "better than BART" analysis, visibility impairment was calculated for the 20% worst days and the 20% best days at each Class I area. For this proposal, the calculation of baseline visibility values for each Class I area generally followed the procedures detailed in the Guidance for Tracking Progress.[13] The baseline visibility on the 20% worst days at each Class I area was calculated using the default IMPROVE visibility equation[14]. The daily deciview values were ranked for each Class I area for 1996. The 20% highest deciview values were identified as the 20% worst days for the year. A similar procedure was followed to get the 20% best days in each Class I area.

Table III-1 shows the current (1998-2002[15]) estimated visibility impairment (in deciviews) at the 44 Class I areas on the 20% worst days and 20% best days at each area[16]. Each IMPROVE site had 1-5 years of complete data available for the analysis. The number of years of complete data for each site is listed in the table.

Table III-1. **Current visibility (1998-2002) on the 20% best days and 20% worst days, at 44 IMPROVE sites**

Class I Area (IMPROVE Site)	IMPROVE Site Identifier	State	Number of Years of Complete Data	1998-2002 Baseline Visibility (in dv) 20% Worst Days	1998-2002 Baseline Visibility (in dv) 20% Best Days
Acadia National Park	ACAD	Maine	5	22.7	8.4

[11] IMPROVE: Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report III (May 2000).

[12] The East is defined as the part of the country that is east of 100 degrees longitude.

[13] U.S. EPA, Guidance for Tracking Progress Under the Regional Haze Rule (Tracking Progress Guidance) (September 2003).

[14] Tracking Progress Guidance, page 3-10.

[15] Analyses under the Regional Haze rule(including BART analyses) will use a five-year visibility base period of 2000-2004. For this analysis, we used visibility data from the most recently available five year period (1998-2002).

[16] The best and worst day calculations for the current visibility used the ambient data from 1998-2002. The best and worst modeling days for each Class I area were identified based on the 1996 ambient data.

Class I Area (IMPROVE Site)	IMPROVE Site Identifier	State	Number of Years of Complete Data	1998-2002 Baseline Visibility (in dv) 20% Worst Days	1998-2002 Baseline Visibility (in dv) 20% Best Days
Badlands National Park	BADL	South Dakota	5	17.3	7.1
Bandelier National Monument	BAND	New Mexico	5	13.2	6.3
Big Bend National Park	BIBE	Texas	4	18.4	7.7
Bliss State Park (Desolation)	BLIS	California	3	12.9	3.5
Bryce Canyon National Park	BRCA	Utah	5	12.0	4.1
Bridger Wilderness	BRID	Wyoming	5	11.5	3.8
Brigantine National Wildlife Refuge	BRIG	New Jersey	4	27.6	13.6
Canyonlands National Park	CANY	Utah	5	12.0	5.3
Chassahowitzka National Wildlife	CHAS	Florida	4	25.7	16.4
Chiricahua National Monument	CHIR	Arizona	5	13.9	5.9
Crater Lake National Park	CRLA	Oregon	3	14.1	3.2
Dolly Sods /Otter Creek Wildernes	DOSO	West Virginia	5	27.6	13.0
Gila Wilderness	GICL	New Mexico	4	13.5	5.1
Glacier National Park	GLAC	Montana	4	19.5	7.3
Grand Canyon- Hopi Point	GRCA	Arizona	3	12.0	4.1
Great Sand Dunes National Monument	GRSA	Colorado	5	13.1	5.7
Great Smoky Mountains National Park	GRSM	Tennessee	5	29.5	14.2
Guadalupe Mountains National Park	GUMO	Texas	5	17.6	7.2
Jarbidge Wilderness	JARB	Nevada	3	12.6	3.0
Jefferson/James River Face Wilderness	JEFF	Virginia	1	28.3	15.8
Lassen Volcanic National Park	LAVO	California	5	14.8	3.3
Lye Brook Wilderness	LYBR	Vermont	4	23.9	6.6
Mammoth Cave National Park	MACA	Kentucky	4	30.2	16.5
Mesa Verde National Park	MEVE	Colorado	5	12.8	5.5
Moosehorn NWR	MOOS	Maine	5	21.4	8.6
Mount Rainier National Park	MORA	Washington	5	18.9	4.9
Mount Zirkel Wilderness	MOZI	Colorado	4	11.7	4.4
Okefenokee National Wildlife Refuge	OKEF	Georgia	5	26.4	15.5

Class I Area (IMPROVE Site)	IMPROVE Site Identifier	State	Number of Years of Complete Data	1998-2002 Baseline Visibility (in dv) 20% Worst Days	1998-2002 Baseline Visibility (in dv) 20% Best Days
Petrified Forest National Park	PEFO	Arizona	5	13.5	6.3
Pinnacles National Monument	PINN	California	3	19.1	8.8
Point Reyes National Seashore	PORE	California	2	20.2	8.6
Redwood National Park	REDW	California	5	16.5	5.0
Cape Romain National Wildlife Refuge	ROMA	South Carolina	4	25.9	13.8
San Gorgonio Wilderness	SAGO	California	4	21.5	6.8
Sequoia National Park	SEQU	California	3	23.5	8.8
Shenandoah National Park	SHEN	Virginia	4	27.6	12.2
Shining Rock Wilderness	SHRO	North Carolina	1	29.7	7.8
Sipsy Wilderness	SIPS	Alabama	4	28.7	16.3
Three Sisters Wilderness	THIS	Idaho	5	15.7	2.8
Tonto National Monument	TONT	Arizona	3	14.7	7.4
Upper Buffalo Wilderness	UPBU	Arkansas	5	25.5	12.2
Weminuche Wilderness	WEMI	Colorado	4	11.6	4.4
Yosemite National Park	YOSE	California	5	17.6	4.0

4. Projection of Future Year Visibility Levels

Future year levels of visibility impairment were estimated by applying relative changes in model predicted visibility to current measurements of ambient data. As with forecasting future year design values for $PM_{2.5}$, the approach for forecasting future visibility impairment used the model predictions in a relative way to project current visibility levels to 2015. The modeling portion of this approach uses the annual simulations for 2001 emissions and the 2015 Base Case emissions scenario. As described below, the predictions from these runs were used to calculate relative reduction factors (RRFs) which were then applied to current visibility values[17]. The approach we followed is consistent with the procedures in the draft regional haze air quality modeling guidance[18].

The modeling guidance recommends that model predictions be used in a relative sense to estimate changes expected to occur in each major PM species that are used to estimate visibility impairment on the 20% best and worst days. These species are ammonium sulfate, ammonium

[17] An example calculation is included in Appendix M of the NPR-AQMTSD.

[18] U.S. EPA, Draft Guidance for Demonstrating Attainment of Air Quality Goals for PM2.5 and Regional Haze. January 2001.

nitrate, organic carbon mass, elemental carbon, crustal mass and coarse mass. Consistent with the IMPROVE procedures, sulfate is assumed to be in the form of ammonium sulfate. Nitrate is assumed to in the form of ammonium nitrate. Measured organic carbon concentrations are multiplied by 1.4 to derive total organic mass. Crustal $PM_{2.5}$ mass is calculated using the IMPROVE crustal formula. Coarse mass is defined as the difference between PM_{10} and $PM_{2.5}$.

The procedure for calculating future year regional haze values is similar to the "Speciated Modeled Attainment Test" (SMAT) that was used to calculate future year $PM_{2.5}$ design values in the January 2004 proposal. The following is a brief summary of those steps. Additional details on the SMAT procedure are provided in the NPR-AQMTSD (Appendix E).

Step 1. Calculate mean light extinction[19] on the 20% worst and best days for each of the six components of regional haze. This is done by using the default IMPROVE equation applied to IMPROVE ambient measurements.

Step 2. For each of the 20% worst and best days[20], calculate the ratio of future (e.g., 2015) to current (i.e., 2001) predictions for each component specie. The result is a component-specific RRF (e.g., assume that 2001 predicted sulfate extinction for a particular location is 50 Mm^{-1} and the 2015 Base extinction is 40 Mm^{-1}, then the RRF for sulfate is 0.8).

Step 3. For each component specie, multiply the current daily component light extinction (step 1) by the component-specific daily RRF obtained in step 2. This produces an estimated future mean light extinction value for each component, for each of the 20% worst(best) days (e.g., sulfate extinction of 50 Mm^{-1} x 0.8 = future sulfate extinction of 40 Mm^{-1}).

Step 4. Sum the daily component extinction values to get total daily light extinction[21] and convert extinction to daily average deciviews.

Step 5. Compute the future mean deciview values for the 20% best and worst days by averaging the daily deciview values.

The results of this analysis are discussed in the next section below.

B. Air Quality Modeling of Proposed Emissions Reductions

Introduction

[19] Light extinction is measured in units of inverse megameters (Mm^{-1}).

[20] The model predicted RRFs are calculated on the 20% best and worst days from 1996 based on the 1996 ambient IMPROVE data.

[21] A value of 10 Mm^{-1} is added to each daily value of bext to account for Rayleigh scattering.

In this section we describe the air quality modeling performed to determine the projected impacts on visibility impairment of the CAIR regional SO_2 and NOx emissions reductions, as well as air quality modeling of the BART program. The visibility improvements from the proposed CAIR strategy were compared to the BART visibility improvements as part of the "better-than-BART" test.

The better-than-BART test is a two pronged test. Under the first prong, visibility must not decline at any Class I area, as determined by comparing the predicted visibility impacts at each affected Class I area under the (CAIR) trading program with existing visibility conditions. Under the second prong, overall visibility, as measured by the average improvement at all affected Class I areas, must be better under the trading program than under source-specific BART. The future year air quality modeling results were used to make this demonstration.

1. Modeling of the CAIR and BART strategies for 2015

The PM and visibility modeling platform described above was used by EPA to model the impacts of the proposed EGU SO_2 and NOx controls on visibility impairment. Modeling for visibility was performed for 2015 to assess the expected effects of the CAIR and BART controls on projected visibility impairment (compared to the 2001 base year).

The modeled effects of the emissions reductions on visibility are expressed in terms of expected future visibility impairment on the 20% best and worst days (in deciviews). Smaller numbers represent better visibility.

Table III-2 shows the projected visibility on the 20% best days at each Class I area in the 2015 baseline and from the CAIR and BART control strategies. Visibility impairment is shown for the 20% best days for the current (1998-2002) baseline, the 2015 baseline, and the CAIR and BART strategies in 2015. Also shown is the average visibility (on the 20% best days) for the 44 Class I areas and the 15 Eastern Class I areas.

Table III-2. **Projected visibility for the 2015 baseline and the 2015 CAIR and BART (as analyzed)[22] strategies on the 20% best days, at 44 IMPROVE sites.**

Class I Areas (IMPROVE Site)	State	1998-2002 Baseline Visibility (dv)	2015 Baseline Visibility (dv)	2015 "CAIR" Control Case Visibility (dv)	2015 "BART" Control Case Visibility (dv)
Acadia National Park	Maine	8.4	8.1	7.8	8.0
Brigantine National Wildlife Refuge	New Jersey	13.6	13.4	12.8	13.1
Chassahowitzka National Wildlife	Florida	16.4	15.2	14.0	13.9
Dolly Sods /Otter Creek Wilderness	West Virginia	13.0	12.4	11.1	11.8
Great Smoky Mountains National Park	Tennessee	14.2	13.7	12.6	13.0
Jefferson/James River Face Wilderness	Virginia	15.8	15.3	14.3	14.8
Lye Brook Wilderness	Vermont	6.6	6.2	6.0	6.1
Mammoth Cave National Park	Kentucky	16.5	15.5	14.8	15.2
Moosehorn NWR	Maine	8.6	8.3	8.2	8.2
Okefenokee National Wildlife Refuge	Georgia	15.5	14.9	14.1	14.4
Cape Romain National Wildlife Refuge	South Carolina	13.8	13.4	12.7	13.0
Shenandoah National Park	Virginia	12.2	11.7	10.6	11.3
Shining Rock Wilderness	North Carolina	7.8	7.5	6.9	7.2
Sipsy Wilderness	Alabama	16.3	15.6	15.1	15.2
Upper Buffalo Wilderness	Arkansas	12.2	11.5	11.2	11.1
Average Visibility (15 Eastern Class I areas)		**12.7**	**12.2**	**11.5**	**11.8**
Badlands National Park	South Dakota	7.1	6.7	6.7	6.7
Bandelier National Monument	New Mexico	6.3	5.9	5.9	5.9
Big Bend National Park	Texas	7.7	7.4	7.3	7.3
Bliss State Park (Desolation)	California	3.5	3.0	3.0	3.0
Bryce Canyon National Park	Utah	4.1	3.7	3.7	3.7
Bridger Wilderness	Wyoming	3.8	3.5	3.5	3.5
Canyonlands National Park	Utah	5.3	5.1	5.1	5.1
Chiricahua National Monument	Arizona	5.9	5.7	5.7	5.7
Crater Lake National Park	Oregon	3.2	2.8	2.8	2.8
Gila Wilderness	New Mexico	5.1	4.9	4.9	4.9
Glacier National Park	Montana	7.3	6.7	6.7	6.7
Grand Canyon- Hopi Point	Arizona	4.1	3.9	3.8	3.8

[22] See section II.B above for discussion of differences between the CAIR as analyzed and as proposed, and see section II.C. above for discussion of differences between BART as analyzed and the maximum potential reductions available from BART as proposed.

Class I Areas (IMPROVE Site)	State	1998-2002 Baseline Visibility (dv)	2015 Baseline Visibility (dv)	2015 "CAIR" Control Case Visibility (dv)	2015 "BART" Control Case Visibility (dv)
Great Sand Dunes National Monument	Colorado	5.7	5.4	5.4	5.4
Guadalupe Mountains National Park	Texas	7.2	6.8	6.7	6.7
Jarbidge Wilderness	Nevada	3.0	2.8	2.8	2.8
Lassen Volcanic National Park	California	3.3	2.9	2.9	2.9
Mesa Verde National Park	Colorado	5.5	5.1	5.1	5.1
Mount Rainier National Park	Washington	4.9	4.3	4.3	4.3
Mount Zirkel Wilderness	Colorado	4.4	4.2	4.2	4.2
Petrified Forest National Park	Arizona	6.3	6.0	6.0	6.0
Pinnacles National Monument	California	8.8	7.9	7.9	7.9
Point Reyes National Seashore	California	8.6	7.7	7.7	7.7
Redwood National Park	California	5.0	4.8	4.8	4.8
San Gorgonio Wilderness	California	6.8	6.4	6.4	6.4
Sequoia National Park	California	8.8	8.1	8.1	8.1
Three Sisters Wilderness	Idaho	2.8	2.5	2.5	2.5
Tonto National Monument	Arizona	7.4	7.2	7.2	7.2
Weminuche Wilderness	Colorado	4.4	4.0	4.0	4.0
Yosemite National Park	California	4.0	3.7	3.7	3.7
Average Visibility (all 44 Class I areas)		**8.0**	**7.5**	**7.3**	**7.4**

The modeling results show that the proposed CAIR cap-and-trade programs will not result in degradation of visibility on the 20% best days, compared to existing visibility conditions (or the 2015 baseline), at any of the 44 Class I areas considered. In each of the 44 areas – the 13 within the proposed CAIR region and the 31 outside of it – visibility is expected to improve (compared to current visibility) or at worst remain unchanged (compared to 2015 baseline visibility).

For Class I areas in the proposed CAIR region, our analysis indicates that proposed CAIR emissions reductions in the East produce greater visibility improvements than source-specific BART. Specifically, for the 15 Eastern Class I areas analyzed, the average visibility improvement (on the 20 percent best days) expected solely as a result of the CAIR is 0.7 deciviews (dv), and the average degree of improvement predicted for source-specific BART is 0.4 dv.

Similarly, on a national basis, the visibility modeling shows that for the 44 class I areas evaluated, the average visibility improvement, on the 20 percent best days, in 2015 was 0.2 dv under the proposed CAIR cap-and-trade programs, and 0.1 dv under the source-specific BART approach

We note that for western Class I areas the projection of greater visibility improvement under BART than under CAIR is an artifact of the available emissions scenarios used for the modeling. Because our CAIR scenario did not include BART reductions in the non-CAIR region, the modeling naturally shows western Class I areas seeing more improvement under a nationwide BART scenario than they do under the CAIR scenario used, with emissions reductions only in the east. This will be resolved when we re-do the air quality modeling using a CAIR scenario which includes BART in the non-CAIR region.

Table III-3 shows the projected visibility on the 20% worst days at each Class I area in the 2015 baseline and from the CAIR and BART control strategies. Visibility impairment is shown for the 20% worst days for the current (1998-2002) baseline, the 2015 baseline, and the CAIR and BART strategies in 2015. Also shown is the average visibility (on the 20% worst days) for the 44 Class I areas and the 15 Eastern Class I areas.

Table III-3- Projected visibility for the 2015 baseline and the 2015 CAIR and BART (as analyzed)[23] strategies on the 20% worst days, at 44 IMPROVE sites.

Class I Area (IMPROVE Site)	State	1998-2002 Baseline Visibility (dv)	2015 Baseline Visibility (dv)	2015 "CAIR" Control Case Visibility (dv)	2015 "BART" Control Case Visibility (dv)
Acadia National Park	Maine	22.7	21.5	20.3	21.0
Brigantine National Wildlife Refuge	New Jersey	27.6	26.5	24.8	25.8
Chassahowitzka National Wildlife	Florida	25.7	24.0	22.0	22.0
Dolly Sods /Otter Creek Wilderness	West Virginia	27.6	25.6	23.0	24.6
Great Smoky Mountains National Park	Tennessee	29.5	27.6	25.0	26.5
Jefferson/James River Face Wilderness	Virginia	28.3	26.6	24.5	25.6
Lye Brook Wilderness	Vermont	23.9	22.9	21.9	22.4
Mammoth Cave National Park	Kentucky	30.2	27.7	25.1	26.9
Moosehorn NWR	Maine	21.4	20.4	19.3	19.9
Okefenokee National Wildlife Refuge	Georgia	26.4	25.1	23.5	24.2
Cape Romain National Wildlife Refuge	South Carolina	25.9	25.2	23.5	24.3
Shenandoah National Park	Virginia	27.6	26.0	23.4	24.9
Shining Rock Wilderness	North Carolina	29.7	27.5	25.1	26.3
Sipsy Wilderness	Alabama	28.7	26.9	24.4	25.8
Upper Buffalo Wilderness	Arkansas	25.5	24.5	22.4	23.1
Average Visibility (15 Eastern Class I areas)		**26.7**	**25.2**	**23.2**	**24.2**

[23] See section II.B above for discussion of differences between CAIR as analyzed and as proposed, and see section II.C. above for discussion of differences between BART as analyzed and the maximum potential reductions available from BART as proposed.

Class I Area (IMPROVE Site)	State	1998-2002 Baseline Visibility (dv)	2015 Baseline Visibility (dv)	2015 "CAIR" Control Case Visibility (dv)	2015 "BART" Control Case Visibility (dv)
Badlands National Park	South Dakota	17.3	16.6	16.2	16.1
Bandelier National Monument	New Mexico	13.2	12.5	12.4	12.3
Big Bend National Park	Texas	18.4	18.0	18.0	18.0
Bliss State Park (Desolation)	California	12.9	11.4	11.4	11.4
Bryce Canyon National Park	Utah	12.0	11.1	11.1	11.0
Bridger Wilderness	Wyoming	11.5	10.4	10.4	10.4
Canyonlands National Park	Utah	12.0	11.3	11.3	11.3
Chiricahua National Monument	Arizona	13.9	13.6	13.6	13.6
Crater Lake National Park	Oregon	14.1	12.4	12.4	12.4
Gila Wilderness	New Mexico	13.5	12.8	12.8	12.8
Glacier National Park	Montana	19.5	18.6	18.6	18.6
Grand Canyon- Hopi Point	Arizona	12.0	11.3	11.3	11.3
Great Sand Dunes National Monument	Colorado	13.1	12.4	12.3	12.2
Guadalupe Mountains National Park	Texas	17.6	17.1	17.0	16.9
Jarbidge Wilderness	Nevada	12.6	11.4	11.4	11.4
Lassen Volcanic National Park	California	14.8	13.5	13.5	13.5
Mesa Verde National Park	Colorado	12.8	12.0	12.0	11.9
Mount Rainier National Park	Washington	18.9	17.0	17.0	16.9
Mount Zirkel Wilderness	Colorado	11.7	10.9	10.9	10.8
Petrified Forest National Park	Arizona	13.5	12.9	12.9	12.9
Pinnacles National Monument	California	19.1	17.5	17.5	17.5
Point Reyes National Seashore	California	20.2	18.4	18.3	18.4
Redwood National Park	California	16.5	14.5	14.5	14.5
San Gorgonio Wilderness	California	21.5	18.6	18.6	18.6
Sequoia National Park	California	23.5	21.3	21.3	21.3
Three Sisters Wilderness	Idaho	15.7	13.8	13.8	13.8
Tonto National Monument	Arizona	14.7	14.0	13.9	13.9
Weminuche Wilderness	Colorado	11.6	10.7	10.7	10.7
Yosemite National Park	California	17.6	16.0	16.0	16.0
Average Visibility (all 44 Class I areas)		**19.2**	**18.0**	**17.3**	**17.6**

The modeling results show that the CAIR cap-and- trade program will not result in degradation of visibility on the 20% worst days, compared to existing visibility conditions (or the 2015 baseline), at any of the 44 Class I areas considered. In each of the 44 areas – the 13 within the proposed CAIR region and the 31 outside of it – visibility is expected to improve (compared to current visibility) or at worst remain unchanged (compared to 2015 baseline visibility). Based on these results, we believe the CAIR impact on emissions passes the first prong of the two-pronged "better-than-BART" test by not causing degradation of visibility at any Class I area on the 20% best or worst visibility days.

For Class I areas in the proposed CAIR region, our analysis indicates that proposed CAIR emissions reductions in the East produce significantly greater visibility improvements than source-specific BART. For the 15 Eastern Class I areas analyzed, the average visibility improvement (on the 20 percent worst days) expected solely as a result of the CAIR is 2.0 deciviews (dv), and the average degree of improvement predicted for source-specific BART is 1.0 dv. Therefore, the proposed CAIR is substantially better than BART – indeed, the proposed CAIR provides more than twice the visibility improvement benefits – for Eastern Class I areas.

Similarly, on a national basis, the visibility modeling shows that for the 44 class I areas evaluated, the average visibility improvement, on the 20 percent worst days, in 2015 was 0.7 dv under the proposed CAIR cap-and-trade programs, but only 0.4 dv under the source-specific BART approach. Based on these results, the proposed CAIR passes the second prong of the better-than-BART test based on the fact that, on average, in both the Eastern Class I areas and nationally, visibility improvement is greater under the proposed CAIR compared to BART on the 20% best and 20% worst visibility days.

2. Better-than-BART Test

We believe the impact of the proposed CAIR on emissions passes the first prong of the two-pronged "better-than-BART" test by not causing degradation of visibility at any Class I area on either the 20% best or 20% worst visibility days. The CAIR also passes the second prong of the better-than-BART visibility test based on the expectation that, on average, in both the Eastern Class I areas and nationally, visibility improvement is greater under the proposed CAIR compared to BART on the 20% best and 20% worst days. We therefore believe that these results, in combination with the emissions analysis in Section II, demonstrate that the both prongs of the better-than-BART test are met.

Appendix

The list of units below reflects the 302 BART-eligible coal-fired generating units larger than 250 MW and for which controls were presumed in the IPM modeling. EPA has estimated that these units had gone online after August 7, 1962, but began construction before August 7, 1977

Table A-1:
Units that were Presumed to be BART-eligible, Requiring Controls, for purposes of Modeling Emissions.

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
MN	Allen S King	1	1968	598
OH	Avon Lake Power Plant	12	1970	680
IN	Bailly	8	1968	422
IL	Baldwin	1	1970	623
IL	Baldwin	2	1973	635
IL	Baldwin	3	1975	635
AL	Barry	4	1969	404
AL	Barry	5	1971	789
NC	Belews Creek	1	1974	1080
NC	Belews Creek	2	1975	1080
MI	Belle River	1	1984	698
MI	Belle River	2	1985	698
FL	Big Bend	BB01	1970	446
FL	Big Bend	BB02	1973	446
FL	Big Bend	BB03	1976	446
TX	Big Brown	1	1971	593
TX	Big Brown	2	1972	593
LA	Big Cajun 2	2B1	1980	559
LA	Big Cajun 2	2B2	1981	559
KY	Big Sandy	BSU1	1963	281
KY	Big Sandy	BSU2	1969	816
SD	Big Stone	1	1975	456
GA	Bowen	1BLR	1971	700
GA	Bowen	2BLR	1972	700
GA	Bowen	3BLR	1974	880
GA	Bowen	4BLR	1975	880
MA	Brayton Point	3	1969	643
CT	Bridgeport Harbor Station	BHB3	1968	400
PA	Bruce Mansfield	1	1976	914
PA	Bruce Mansfield	2	1977	914
PA	Bruce Mansfield	3	1980	914

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
PA	Brunner Island	2	1965	405
PA	Brunner Island	3	1969	790
TN	Bull Run	1	1967	950
KY	Cane Run	6	1969	272
OH	Cardinal	1	1967	615
OH	Cardinal	2	1967	615
OH	Cardinal	3	1977	650
IN	Cayuga	1	1970	531
IN	Cayuga	2	1972	531
WA	Centralia	BW21	1972	730
WA	Centralia	BW22	1973	730
MD	Chalk Point	1	1964	364
MD	Chalk Point	2	1965	364
VA	Chesterfield	5	1964	359
VA	Chesterfield	6	1969	694
PA	Cheswick	1	1970	565
AZ	Cholla	3	1980	289
AZ	Cholla	2	1978	289
AZ	Cholla	4	1981	414
MN	Clay Boswell	3	1973	365
NC	Cliffside	5	1972	571
ND	Coal Creek	1	1979	506
ND	Coal Creek	2	1981	506
IL	Coffeen	01	1965	389
IL	Coffeen	02	1972	617
AL	Colbert	5	1965	550
WI	Columbia	1	1975	512
WI	Columbia	2	1978	512
CO	Comanche (470)	1	1973	350
CO	Comanche (470)	2	1975	350
PA	Conemaugh	1	1970	936
PA	Conemaugh	2	1971	936
OH	Conesville	4	1973	842
OH	Conesville	5	1976	444
OH	Conesville	6	1978	444
AZ	Coronado Generating Station	U1B	1979	411
AZ	Coronado Generating Station	U2B	1980	411
IA	Council Bluffs	3	1978	726
CO	Craig	C1	1980	446
CO	Craig	C2	1979	446
FL	Crist Electric Generating Plant	6	1970	370
FL	Crist Electric Generating Plant	7	1973	578

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
FL	Crystal River	1	1966	441
FL	Crystal River	2	1969	524
FL	Crystal River	4	1982	739
FL	Crystal River	5	1984	739
TN	Cumberland	1	1973	1300
TN	Cumberland	2	1973	1300
MS	Daniel Electric Generating Plant	1	1977	500
MS	Daniel Electric Generating Plant	2	1981	500
WY	Dave Johnston	BW44	1972	360
IL	Duck Creek	1	1976	441
AL	E C Gaston	5	1974	952
IL	E D Edwards	2	1968	281
IL	E D Edwards	3	1972	364
KY	E W Brown	3	1971	446
OH	Eastlake	5	1972	680
KY	Elmer Smith	2	1974	265
IN	F B Culley Generating Station	3	1973	265
FL	F J Gannon	GB06	1967	414
AR	Flint Creek	1	1978	558
WV	Fort Martin	1	1967	576
WV	Fort Martin	2	1968	576
NM	Four Corners	3	1964	253
NM	Four Corners	4	1969	818
NM	Four Corners	5	1970	818
OH	Gen J M Gavin	1	1974	1300
OH	Gen J M Gavin	2	1975	1300
WI	Genoa	1	1969	346
IA	George Neal North	2	1972	349
IA	George Neal North	3	1975	550
NE	Gerald Gentleman Station	1	1979	681
NE	Gerald Gentleman Station	2	1982	681
KY	Ghent	2	1977	556
KY	Ghent	1	1974	557
IN	Gibson	1	1976	668
IN	Gibson	2	1975	668
IN	Gibson	3	1978	668
IN	Gibson	4	1979	668
AL	Gorgas	10	1972	789
AL	Greene County	2	1966	269
AL	Greene County	1	1965	299

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
KY	H L Spurlock	1	1977	305
KY	H L Spurlock	2	1981	508
GA	Hammond	4	1970	500
IN	Harding Street Station (EW Stout)	70	1973	471
GA	Harllee Branch	1	1965	250
GA	Harllee Branch	2	1967	319
GA	Harllee Branch	3	1968	481
GA	Harllee Branch	4	1969	490
TX	Harrington Station	061B	1976	360
WV	Harrison	1	1972	684
WV	Harrison	2	1973	684
WV	Harrison	3	1974	684
PA	Hatfields Ferry	1	1969	576
PA	Hatfields Ferry	2	1970	576
PA	Hatfields Ferry	3	1971	576
IL	Havana	9	1978	488
CO	Hayden	H2	1976	275
MD	Herbert a Wagner	3	1966	359
PA	Homer City	1	1969	660
PA	Homer City	2	1969	660
PA	Homer City	3	1977	692
NJ	Hudson	2	1968	660
UT	Huntington	2	1974	446
UT	Huntington	1	1977	446
AR	Independence	1	1983	850
MI	J H Campbell	1	1962	265
MI	J H Campbell	2	1967	385
MI	J H Campbell	3	1980	871
OH	J M Stuart	1	1971	610
OH	J M Stuart	2	1970	610
OH	J M Stuart	3	1972	610
OH	J M Stuart	4	1974	610
TX	J T Deely	1	1977	446
TX	J T Deely	2	1978	446
AL	James H Miller Jr	1	1978	706
AL	James H Miller Jr	2	1985	706
KS	Jeffrey Energy Center	1	1978	720
KS	Jeffrey Energy Center	2	1980	720
WY	Jim Bridger	BW71	1974	561
WY	Jim Bridger	BW72	1975	561
WY	Jim Bridger	BW73	1976	561

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
WY	Jim Bridger	BW74	1979	561
WV	John E Amos	1	1971	816
WV	John E Amos	2	1972	816
WV	John E Amos	3	1973	1300
IL	Joliet 29	71	1965	660
IL	Joliet 29	72	1965	660
IL	Joliet 29	81	1965	660
IL	Joliet 29	82	1965	660
PA	Keystone	1	1967	936
PA	Keystone	2	1968	936
IL	Kincaid	1	1967	660
IL	Kincaid	2	1968	660
NC	L V Sutton	3	1972	447
KS	La Cygne	2	1977	685
KS	La Cygne	1	1973	893
MO	Labadie	1	1970	574
MO	Labadie	2	1971	574
MO	Labadie	3	1972	621
MO	Labadie	4	1973	621
OH	Lake Shore	18	1962	256
IA	Lansing	4	1977	275
WY	Laramie River	3	1982	570
WY	Laramie River	1	1980	570
WY	Laramie River	2	1981	570
KS	Lawrence Energy Center	5	1971	458
NC	Lee	3	1962	252
ND	Leland Olds	2	1975	440
NC	Marshall	1	1965	350
NC	Marshall	2	1966	350
NC	Marshall	3	1969	648
NC	Marshall	4	1970	648
TX	Martin Lake	1	1977	793
TX	Martin Lake	2	1978	793
IN	Merom	1SG1	1983	540
IN	Merom	2SG1	1982	540
NH	Merrimack	2	1968	346
OH	Miami Fort	7	1975	557
OH	Miami Fort	8	1978	558
IN	Michigan City	12	1974	540
KY	Mill Creek	1	1972	356
KY	Mill Creek	2	1974	356
KY	Mill Creek	3	1978	463

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
KY	Mill Creek	4	1982	544
ND	Milton R Young	B1	1970	257
ND	Milton R Young	B2	1977	477
WV	Mitchell	1	1971	816
WV	Mitchell	2	1971	816
PA	Mitchell	33	1963	299
NV	Mohave	1	1971	818
NV	Mohave	2	1971	818
MI	Monroe	1	1971	817
MI	Monroe	4	1974	817
MI	Monroe	2	1973	823
MI	Monroe	3	1973	823
TX	Monticello	1	1974	593
TX	Monticello	2	1975	593
TX	Monticello	3	1978	793
PA	Montour	2	1973	819
PA	Montour	1	1972	823
MD	Morgantown	1	1970	626
MD	Morgantown	2	1971	626
WV	Mount Storm Power Station	3	1973	522
WV	Mount Storm Power Station	1	1965	570
WV	Mount Storm Power Station	2	1966	570
WV	Mountaineer (1301)	1	1980	1300
OH	Muskingum River	5	1968	615
OK	Muskogee	4	1977	572
OK	Muskogee	5	1978	572
WY	Naughton	3	1971	326
AZ	Navajo Generating Station	1	1974	803
AZ	Navajo Generating Station	2	1975	803
AZ	Navajo Generating Station	3	1976	803
MO	New Madrid	1	1972	600
MO	New Madrid	2	1977	600
IL	Newton	1	1977	617
IL	Newton	2	1982	617
OK	Northeastern	3313	1979	473
OK	Northeastern	3314	1980	473
KY	Paradise	3	1970	1150
KY	Paradise	1	1963	704
KY	Paradise	2	1963	704
IN	Petersburg	1	1967	253
IN	Petersburg	2	1969	471
IN	Petersburg	3	1977	574

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
WV	Pleasants	1	1979	684
WV	Pleasants	2	1980	684
PA	Portland	2	1962	255
IL	Powerton	51	1972	893
IL	Powerton	52	1972	893
IL	Powerton	61	1975	893
IL	Powerton	62	1975	893
IN	R M Schahfer	14	1976	540
IN	R M Schahfer	15	1979	556
NC	Roxboro	1	1966	411
NC	Roxboro	2	1968	657
NC	Roxboro	3A	1973	745
NC	Roxboro	3B	1973	745
NC	Roxboro	4A	1980	745
NC	Roxboro	4B	1980	745
MO	Rush Island	1	1976	621
MO	Rush Island	2	1977	621
TX	Sam Seymour	1	1979	615
TX	Sam Seymour	2	1980	615
NM	San Juan	2	1973	350
NM	San Juan	1	1976	361
NM	San Juan	3	1979	534
NM	San Juan	4	1982	534
GA	Scherer	1	1982	818
GA	Scherer	2	1984	818
MN	Sherburne County	1	1976	660
MN	Sherburne County	2	1977	660
MO	Sibley	3	1969	419
MO	Sioux	1	1967	550
MO	Sioux	2	1968	550
OK	Sooner	1	1979	569
OK	Sooner	2	1980	569
WI	South Oak Creek	7	1965	318
WI	South Oak Creek	8	1967	324
MI	St. Clair	7	1969	545
IN	State Line Generating Station (IN)	4	1962	389
IN	Tanners Creek	U4	1964	580
MO	Thomas Hill	MB2	1969	285
MI	Trenton Channel	9A	1968	536
TX	W A Parish	WAP5	1977	734
TX	W A Parish	WAP6	1978	734

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
OH	W H Sammis	5	1967	318
OH	W H Sammis	6	1969	623
OH	W H Sammis	7	1971	623
IN	Wabash River	6	1968	387
OH	Walter C Beckjord	6	1969	461
GA	Wansley (6052)	1	1976	865
GA	Wansley (6052)	2	1978	865
IN	Warrick	4	1970	323
SC	Wateree	WAT1	1970	386
SC	Wateree	WAT2	1971	386
IL	Waukegan	8	1962	355
TX	Welsh	1	1977	558
TX	Welsh	2	1980	558
TX	Welsh	3	1982	558
AR	White Bluff	1	1980	850
AR	White Bluff	2	1981	850
AL	Widows Creek	8	1965	550
IL	Will County	4	1963	598
SC	Williams	WIL1	1973	633
SC	Winyah	1	1975	315
SC	Winyah	2	1977	315
IL	Wood River	5	1964	388
WY	Wyodak	BW91	1978	362

[1] Nameplate capacity of generator connected to boiler