Technical Support Document
for the Final
Clean Air InterState Rule

Demonstration that CAIR Satisfies the "Better-than-BART" Test As proposed in the Guidelines for Making BART Determinations

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Demonstration that CAIR Satisfies the "Better-than-BART" Test as Proposed in the Guidelines for Making BART Determinations

Introduction

This document provides additional background and analyses demonstrating that the CAIR cap and trade program for EGUs would result in greater overall visibility improvement than BART for EGUs, and would not result in visibility degradation at any Class I area. Section IX.C. of the Notice of Final Rulemaking (NFR) of the Clean Air InterState Rule (CAIR) discusses the regulatory context of this demonstration, noting that a determination whether CAIR achieves greater progress than BART is contingent upon the finalization of the proposed guidelines for implementing BART (to be finalized by April 15, 2005, under a consent decree), as well as finalization of the criteria for evaluating alternative programs to BART.

As proposed in the April 2004 proposed BART guidelines rule, the criteria for evaluating BART-alternative trading programs are as follows. First, if the geographic distribution of emission reductions is not projected to be significantly different under the alternative program compared to source-specific BART, and emissions reductions are greater under the alternative program, then the alternative program may be presumed to achieve greater progress. Second, if the geographic distribution of reductions is different, then visibility modeling must be conducted. The alternative program would demonstrate greater progress if (1) visibility does not decline in any Class I area, and (2) there is an overall improvement in visibility, determined by comparing the average differences over all affected Class I areas.

It is important to keep in mind that these criteria have not been finalized, nor have all of the subsidiary issues inherent in the criteria been resolved. These issues include the geographic region over which emission reductions should be compared (i.e., whether it is limited to the trading program area); the definition of "affected" Class I areas; and the metrics used for the two-part visibility test (i.e., the best or worst 20% days or both, or some other measure, for each prong). Because the CAIR cap and trade program for SO2 utilizes federal Title IV allowances, and in order to be conservative (environmentally protective), we apply the criteria in the most comprehensive manner possible. That is, we consider the total amount and geographic distribution of emission reductions on a national basis; consider all Class I areas in the lower 48 States to be potentially affected; and evaluate both the best 20% and worst 20% days for both the "no degradation" and "greater overall improvement" prongs of the visibility test. As discussed below, our best current analysis indicates CAIR would satisfy the proposed test for greater progress, even so broadly applied. However, the application of the criteria in this manner should not be considered to be a final EPA decision.

Section I of this document explains how the scenarios modeled in the May 2004 Supplemental Notice of Proposed Rulemaking (SNPR) have been revised. Modeling of the CAIR requirements was improved to more accurately reflect the final CAIR requirements. Modeling of BART was improved to reflect not only the presumptive requirements, but also to take a conservative (i.e. controls on most units) look at controls that States might choose to require on sources not subject to presumptive BART. This ensures that even if EPA were to finalize a more stringent presumptive BART than was proposed and if most States determined that add-on controls were required for BART eligible EGUs not subject to the presumptive requirements, this analysis would still be valid. Section II describes how these emissions projections were used to model visibility conditions in Class I areas, in order to apply the "Better than BART" test as contained in our proposed BART guidelines.

I. Emissions Projections Used for CAIR Analysis

A. Overview of Emission Projections

In performing the "Better-than-BART" analysis, EPA stated in the June SNPR that it 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. The visibility impacts of this scenario would be compared to otherwise-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 would be made for the year in which source-specific BART would be fully implemented (2014).

In the SNPR, the available modeling runs approximated, but did not exactly match, the scenarios described above. Specifically, emissions projections for BART were then available only on a nationwide basis, and only for coal-fired EGUs larger than 250 MW. The available emissions projections reflecting implementation of the proposed CAIR were based on *nationwide* SO2 emission reductions requirements. The NO_x emissions reduction requirements were based on a 32 State region, that was slightly larger than the proposed CAIR Region without any NOx reduction requirements (such as BART would require) being in effect outside the 32 State region. EPA believed that, despite these differences in the geographic scope of the proposed CAIR emission reductions requirements as modeled and as proposed, our CAIR modeling reasonably approximated the expected emissions under the proposed CAIR. Similarly, we believed that the emissions projections we used to represent BART implementation reasonably approximated emissions under BART as ideally modeled.

For the NFR, EPA has refined its modeling to match the ideal "Better-than-BART" analysis outlined above: modeling nationwide BART for EGUs (with controls as proposed and modeled in the April 2004 guidelines) and a separate scenario consisting of CAIR reductions in the CAIR-affected States plus BART-reductions in the remaining States (excluding Alaska and Hawaii). In the modeling presented in this document, the CAIR region includes Kansas. Kansas is not part of the final CAIR region. Furthermore, the modeling assumes annual reductions of SO2 and NOx are required in Arkansas, Delaware and New Jersey. The final CAIR only requires ozone season NOx reduction requirements in those three States. The implications of this are discussed in the next section.

For the modeling of BART, EPA made two changes. First**,** EPA more accurately determined which units with on-line dates after 1978 were BART-eligible. A description of how this was done, along with a complete list of BART-eligible sources used in the modeling can be found in the Appendix A and Appendix B respectively.[1]

Second, the control assumption assumes that in addition to EPA's proposed presumptive BART on units greater than 250 MW, States determine that smaller units should also install controls as part of their source specific BART analysis. This analysis assumes that all BART units greater than 100 MW that do not currently have scrubbers are required to reduce emissions from uncontrolled levels by 90% or meet a 0.1 lb/mmbtu SO2 emission rate limit. It also assumes that all BART units greater than 25 MW are required to meet an emission rate limit of 0.2 lbs/mmbtu.

B. CAIR + BART EGU Emissions Projections

BART is applicable to fossil-fuel fired steam electric plants of more than 250 million BTU/hr heat input 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, in order to be directly comparable with the CAIR emission reduction requirements which are based on highly cost effective controls at EGUs).

EPA recognizes that States would also be required to make BART determinations for BART eligible units smaller than 250 MW. Consequently, EPA's new analysis of BART includes coal-fired units greater than 100 MW as BART-eligible for SO2 and units greater than 25 MW as BART-eligible for NO_x.

The State-by-State emissions under the CAIR + BART case are presented in Table I-1 below.[2] The State-by-State emissions under the proposed BART nationwide case are presented in Table I-2 below.

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[1] See also CAIR Regulatory Impact Analysis, Appendix D, for a brief description of the IPM runs done for this analysis.

[2] 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/ .

Table I-1: State-by-State EGU Emissions Projections under CAIR + BART in 2015 (1000 tons).

CAIR-Region States	2015 EGU Emissions Under CAIR w/ BART in non-CAIR region		Non-CAIR Region States	2015 EGU Emissions under CAIR w/ BART in non-CAIR region	
	SO_2	NO_x		SO_2	NO_x
Alabama	255	49	Arizona	60	51
Arkansas†	82	32	California	3	19
Delaware†	18	7	Colorado	47	45
District Of Columbia	0	0	Connecticut*	3	7
Florida	167	61	Idaho	0	1
Georgia	249	66	Kansas	49	39
Illinois	239	65	Maine	5	2
Indiana	353	84	Massachusetts*	17	19
Iowa	125	39	Montana	20	37
Kentucky	271	64	Nebraska	30	33
Louisiana	62	30	Nevada	27	26
Maryland	24	12	New Hampshire	7	3
Michigan	385	85	New Mexico	52	32
Minnesota	72	37	North Dakota	82	44
Mississippi	86	12	Oklahoma	37	53
Missouri	245	58	Oregon	10	7
New Jersey†	21	11	Rhode Island	0	0
New York	41	34	South Dakota	2	3
North Carolina	139	49	Utah	53	50
Ohio	202	80	Vermont	0	0
Pennsylvania	133	77	Washington	9	12
South Carolina	106	36	Wyoming	69	44
Tennessee	161	27	Total	583	527
Texas	352	160			
Virginia	116	38			
West Virginia	116	44			
Wisconsin	132	32			
Total	4152	1289			

*Connecticut and Massachusetts are CAIR region States for purposes of summertime NO_x only and were modeled as such.

† Arkansas, Delaware, and New Jersey are subject to CAIR for summertime NO_x only but were modeled as being subject to CAIR for both NO_x and $PM_{2.5.}$

Table I-2: State-by-State EGU Emissions Projections under BART Nationwide in 2015 (1000 tons).

CAIR-Region State	2015EGU Emissions Under "BART nationwide"		Non-CAIR Region State	2015 EGU Emissions Under "BART nationwide"	
	SO_2	NO_x		SO_2	NO_x
Alabama	272	111	Arizona	60	51
Arkansas†	15	31	California	3	20
Delaware†	16	9	Colorado	47	45
District Of Columbia	0	0	Connecticut*	4	6
Florida	159	120	Idaho	0	1
Georgia	205	77	Kansas	63	39
Illinois	280	86	Maine	5	2
Indiana	1128	166	Massachusetts*	18	19
Iowa	96	51	Montana	27	37
Kentucky	307	91	Nebraska	71	33
Louisiana	31	38	Nevada	27	26
Maryland	84	24	New Hampshire	7	3
Michigan	219	85	New Mexico	52	32
Minnesota	114	50	North Dakota	88	43
Mississippi	25	19	Oklahoma	43	53
Missouri	184	66	Oregon	10	7
New Jersey†	39	13	Rhode Island	0	0
New York	131	44	South Dakota	2	3
North Carolina	91	56	Utah	53	50
Ohio	1100	169	Vermont	0	0
Pennsylvania	372	123	Washington	10	13
South Carolina	120	34	Wyoming	82	44
Tennessee	566	83	Total	671	526
Texas	257	181			
Virginia	217	61			
West Virginia	402	90			
Wisconsin	58	47			
Total	6491	1928			

*Connecticut and Massachusetts are CAIR region States for purposes of summertime NO_x only and were modeled as such.

† Arkansas, Delaware, and New Jersey are subject to CAIR for summertime NO_x only but were modeled as being subject to CAIR for both NO_x and $PM_{2.5.}$

C. Comparing BART and CAIR Projections

As can be seen in the tables above, for SO_2 on a national basis, CAIR + BART would achieve 2.4 million tons more reductions than nationwide BART in 2015.[3] For NO_x, the CAIR + BART scenario is projected to result in about 640,000 tons more emissions reductions than the BART nationwide scenario in 2015. For Connecticut, Delaware, and New Jersey, the differences between emissions under the nationwide BART scenario compared to the CAIR

[3] Projected national emissions under nationwide BART are 6,491,000 tons in the CAIR region + 671,000 tons in the non-CAIR region = 7,162,000 tons. National emissions under CAIR+BART are 4,152,000 in the CAIR region + 583,000 in the non-CAIR region = 4,735,000 tons. CAIR + BART is therefore superior to BART by a margin of 7,162,000 – 4,152,000 = 2,427,000 tons.

scenario (with BART in the non-CAIR region) are about 51,000 tons of SO2 and 3,000 tons of NO_X. These amounts represent about 2% of the difference in SO2 and 0.5% of the difference in NOx in the CAIR region between the BART and CAIR scenarios.[4] Thus, their inclusion or exclusion from CAIR would not be likely to affect the determination of whether CAIR+BART is better than source-specific BART applied nationally.

The BART analysis does not assume controls on oil and gas-fired units. However, nationwide NO_x emissions from all (not just BART-eligible) oil and gas steam plants, combined cycle as well as simple cycle turbines (which are not subject to BART) in 2015 are projected to be about 144,000 tons, or less than 8% of the projected total 2015 EGU NO_x emissions. Also, many of the oil and gas units associated with those tons would not be eligible for BART since their construction dates do not fall within the necessary time-frame. In summary, even if all of the NO_x emissions from oil and gas EGUs were reduced to zero under the BART scenario, CAIR+BART will still produce significantly greater emission reductions than BART. IPM does not predict any difference in SO2 emissions from oil or gas-fired units between CAIR+BART and BART nationwide runs.

The tables also indicate that the geographic distribution of emission reductions are projected to be different under the two scenarios. Under the proposed criteria for evaluating BART-alternative trading programs, this necessitates proceeding to the two-pronged visibility test for greater progress.

D. Year of CAIR-to-BART Comparison

As noted in the SNPR, the analysis is based on emissions projections for the year 2015, because that is the year for which the air quality modeling was performed in developing the CAIR proposal.

BART does not require or provide incentives for reductions before 2014, or 2013 at the earliest.[5] (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.) In contrast, CAIR will result in substantial emission reductions beginning in 2009 for NOx and 2010 for SO2. Additionally, emissions in the BART case will grow after 2015 with the growth of the EGU sector (and lack of

[4] In the CAIR region, the difference in SO2 between the scenarios equals 6,491,000 tons under BART – 4,152,000 tons under CAIR + BART = 2,339,000 tons. 51,000 tons is 2.2 % of this number. For NOx, the difference in scenarios equals 1,928,000 tons under BART – 1,289,000 tons under CAIR+BART = 639,000 tons. 3,000 tons is about 0.5% of this number.

[5] 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.

a cap), while SO2 emissions would decline after 2015 in the CAIR case as the bank of SO2 allowances is used up, and NOx emissions would remain constant because of the cap. Therefore, by comparing emissions in 2015, we are basing the better-than-BART comparison on the time period in which the emission reductions in BART scenario come closest to the emission reductions under CAIR. This is a conservative approach, as the superiority of CAIR reductions will be even greater in the years prior to and after this point.

II. 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 finding in the CAIR final rulemaking that compliance with the CAIR model trading rule by BART-eligible sources would result in greater visibility improvement than source-specific BART.

This section also includes technical information on the air quality model applied in support of the final rule, and the procedures for projecting regional haze for future year scenarios. The CAIR NFR-Air Quality Modeling Technical Support Document (NFR-AQMTSD)[6] 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 for 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 for the comparison of the effects of compliance with a nationwide BART program (for EGUs) to the proposed CAIR model trading 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, which contains emissions for 2015 based on predicted growth and existing emissions controls.[7] 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

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

[7] This is the same 2015 base case model run used to determine predicted nonattainment status as described in preamble section VI and the NFR-AQMTSD.

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 base year 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 + BART[8] control strategy as well as the nationwide 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 and the June 2004 supplemental proposal to develop base and future year predictions of $PM_{2.5}$ concentrations and visibility impairment. In the proposal modeling, we used the REMSAD model to predict base and future year $PM_{2.5}$ levels. For the final rule modeling we used the CMAQ model to predict PM2.5 levels. We used the CMAQ predicted $PM_{2.5}$ components to estimate future year changes in visibility at Class I areas. Details of the application of CMAQ for the CAIR final rule, including model performance, can be found in Section VI of the NFR preamble and the NFR-AQMTSD. Familiarity with that detailed description is assumed for present purposes.

As described in the NFR-AQMTSD, we performed a 2001 Base Year model simulation to examine the ability of the modeling system to replicate observed concentrations of PM and its precursors. 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 future-year base case model runs with the results of the CAIR + BART and nationwide BART control strategy model runs.

We quantified visibility impacts in this manner at the Class I areas which have complete IMPROVE ambient data for 2001 or are represented by IMPROVE monitors with complete data. Since the base year meteorology used in the CMAQ modeling is from 2001, ambient data from 2001 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 2001, 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 (representing all 156 Class I areas) collecting ambient PM2.5 data at Class I areas. Of these 110 sites, 81 of have complete data for

[8]The CAIR + BART strategy is CAIR applied in the region where it is in effect and BART applied in the rest of the contiguous U.S., as previously defined.

2001. These 81 sites are representative of 116 Class I areas.[9]

These 116 sites are scattered throughout the country and represent all of the IMPROVE defined regional visibility areas[10]. Of the 116 Class I areas, 29 are in the East[11] and 87 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. The calculation of baseline visibility values for each Class I area generally followed the procedures detailed in the Guidance for Tracking Progress.[12] The baseline visibility on the 20% worst days at each Class I area was calculated using the default IMPROVE visibility equation[13]. The daily deciview values were calculated and ranked for each Class I area for each of five years for period 1998-2002[14]. 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[15].

Table II-1 shows the current (1998-2002) estimated visibility impairment (in deciviews)

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[9] The matching of sites to monitors is taken from the Guidance for Tracking Progress Under the Regional Haze Rule, EPA-454/B-03-004, September 2003.

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

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

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

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

[14]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).

[15]The daily current visibility data for the 116 Class I areas was downloaded from the VIEWS website. The dataset can be found at:
http://vista.cira.coloState.edu/DataWarehouse/IMPROVE/Data/SummaryData/daily_budgets_30Jan04.csv. The calculations followed the recommended procedures in the Guidance for Tracking Progress.

at the 116 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 II-1. Current Visibility (1998-2002) on the 20% Best Days and 20% Worst Days, at 116 IMPROVE Sites

Class I Area	IMPROVE Representative Site	IMPROVE Site Identifier	State	Number of Years of Complete Data	1998-2002 Baseline Visibility (in dv) 20% Best Days	1998-2002 Baseline Visibility (in dv) 20% Worst Days
Acadia	Acadia	ACAD	ME	5	8.4	22.7
Boundary Waters Canoe Area	Boundary Waters	BOWA	MN	3	6.4	20.0
Brigantine	Brigantine	BRIG	NJ	4	13.6	27.6
Caney Creek	Caney Creek	CACR	AR	2	12.1	25.9
Cape Romain	Cape Romain	ROMA	SC	4	13.8	25.9
Chassahowitzka	Chassahowitzka	CHAS	FL	4	16.4	25.7
Dolly Sods	Dolly Sods	DOSO	WV	5	13.0	27.6
Everglades	Everglades	EVER	FL	2	10.8	20.3
Great Gulf	Great Gulf	GRGU	NH	2	7.8	23.2
Great Smoky Mountains	Great Smoky Mountains	GRSM	TN	5	14.2	29.5
Isle Royale	Isle Royale	ISLE	MI	3	6.2	21.1
James River Face	James River Face	JARI	VA	3	15.5	28.5
Joyce Kilmer - Slickrock	Great Smoky Mountains	GRSM	NC	5	14.2	29.5
Linville Gorge	Linville Gorge	LIGO	NC	2	12.2	27.9
Lye Brook	Lye Brook	LYBR	VT	4	6.6	23.9
Mammoth Cave	Mammoth Cave	MACA	KY	4	16.5	30.2
Mingo	Mingo	MING	MO	2	14.1	27.5
Moosehorn	Moosehorn	MOOS	ME	5	8.6	21.4
Okefenokee	Okefenokee	OKEF	GA	5	15.5	26.4
Otter Creek	Dolly Sods	DOSO	WV	5	13.0	27.6
Presidential Range - Dry	Great Gulf	GRGU	NH	2	7.8	23.2
Roosevelt Campobello	Moosehorn	MOOS	ME	5	8.6	21.4

[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 2001ambient data.

Class I Area	**IMPROVE Representative Site**	**IMPROVE Site Identifier**	**State**	**Number of Years of Complete Data**	**1998-2002 Baseline Visibility (in dv) 20% Best Days**	**1998-2002 Baseline Visibility (in dv) 20% Worst Days**
Seney	Seney	SENE	MI	3	6.4	23.8
Shenandoah	Shenandoah	SHEN	VA	4	12.2	27.6
Sipsey	Sipsey	SIPS	AL	4	16.3	28.7
Swanquarter	Swanquarter	SWAN	NC	2	12.4	24.6
Upper Buffalo	Upper Buffalo	UPBU	AR	5	12.2	25.5
Voyageurs	Voyageurs	VOYA	MN	3	6.4	18.4
Wolf Island	Okefenokee	OKEF	GA	5	15.5	26.4
Agua Tibia	Agua Tibia	AGTI	CA	2	10.0	23.2
Alpine Lakes	Snoqualmie Pass	SNPA	WA	3	5.6	18.0
Anaconda - Pintler	Sula	SULA	MT	2	3.1	12.3
Arches	Canyonlands	CANY	UT	5	5.3	12.0
Badlands	Badlands	BADL	SD	5	7.1	17.3
Bandelier	Bandelier	BAND	NM	5	6.3	13.2
Big Bend	Big Bend	BIBE	TX	4	7.7	18.4
Black Canyon of the Gunnison	Weminuche	WEMI	CO	4	4.4	11.6
Bob Marshall	Monture	MONT	MT	2	4.5	14.2
Bridger	Bridger	BRID	WY	5	3.8	11.5
Bryce Canyon	Bryce Canyon	BRCA	UT	5	4.1	12.0
Cabinet Mountains	Cabinet Mountains	CABI	MT	2	4.1	13.8
Canyonlands	Canyonlands	CANY	UT	5	5.3	12.0
Caribou	Lassen Volcanic	LAVO	CA	5	3.3	14.8
Carlsbad Caverns	Guadalupe Mountains	GUMO	NM	5	7.2	17.6
Chiricahua NM	Chiricahua	CHIR	AZ	5	5.9	13.9
Chiricahua W	Chiricahua	CHIR	AZ	5	5.9	13.9
Craters of the Moon	Craters of the Moon	CRMO	ID	2	5.0	14.7
Desolation	Bliss	BLIS	CA	3	3.5	12.9
Dome Land	Dome Land	DOME	CA	2	5.4	20.3
Eagle Cap	Starkey	STAR	OR	2	5.6	19.6
Eagles Nest	White River	WHRI	CO	2	2.8	11.3
Emigrant	Yosemite	YOSE	CA	5	4.0	17.6
Fitzpatrick	Bridger	BRID	WY	5	3.8	11.5
Flat Tops	White River	WHRI	CO	2	2.8	11.3
Galiuro	Chiricahua	CHIR	AZ	5	5.9	13.9

Class I Area	IMPROVE Representative Site	IMPROVE Site Identifier	State	Number of Years of Complete Data	1998-2002 Baseline Visibility (in dv) 20% Best Days	1998-2002 Baseline Visibility (in dv) 20% Worst Days
Gates of the Mountains	Gates of the Mountains	GAMO	MT	2	3.1	11.2
Gila	Gila Cliffs	GICL	NM	4	5.1	13.5
Glacier	Glacier	GLAC	MT	4	7.3	19.5
Glacier Peak	North Cascades	NOCA	WA	2	2.8	14.0
Grand Teton	Yellowstone	YELL	WY	4	3.7	12.1
Great Sand Dunes	Great Sand Dunes	GRSA	CO	5	5.7	13.1
Guadalupe Mountains	Guadalupe Mountains	GUMO	TX	5	7.2	17.6
Hells Canyon	Hells Canyon	HECA	OR	2	5.4	18.1
Jarbidge	Jarbidge	JARB	NV	3	3.0	12.6
Joshua Tree	Joshua Tree	JOSH	CA	2	6.6	19.5
Kalmiopsis	Kalmiopsis	KALM	OR	2	4.7	14.8
Kings Canyon	Sequoia	SEQU	CA	3	8.8	23.5
La Garita	Weminuche	WEMI	CO	4	4.4	11.6
Lassen Volcanic	Lassen Volcanic	LAVO	CA	5	3.3	14.8
Lava Beds	Lava Beds	LABE	CA	2	3.7	16.6
Lostwood	Lostwood	LOST	ND	3	8.3	19.6
Marble Mountain	Trinity	TRIN	CA	1	3.5	17.1
Maroon Bells - Snowmass	White River	WHRI	CO	2	2.8	11.3
Mazatzal	Ike's Backbone	IKBA	AZ	2	6.1	13.1
Medicine Lake	Medicine Lake	MELA	MT	3	7.5	17.7
Mesa Verde	Mesa Verde	MEVE	CO	5	5.5	12.8
Mission Mountains	Monture	MONT	MT	2	4.5	14.2
Mokelumne	Bliss	BLIS	CA	3	3.5	12.9
Mount Hood	Mount Hood	MOHO	OR	2	2.5	14.0
Mount Jefferson	Three Sisters	THSI	OR	5	2.8	15.7
Mount Rainier	Mount Rainier	MORA	WA	5	4.9	18.9
Mount Washington	Three Sisters	THSI	OR	5	2.8	15.7
Mount Zirkel	Mount Zirkel	MOZI	CO	4	4.4	11.7
North Cascades	North Cascades	NOCA	WA	2	2.8	14.0
Pasayten	Pasayten	PASA	WA	2	2.9	14.7
Petrified Forest	Petrified Forest	PEFO	AZ	5	6.3	13.5
Pine Mountain	Ike's Backbone	IKBA	AZ	2	6.1	13.1
Rawah	Mount Zirkel	MOZI	CO	4	4.4	11.7

Class I Area	IMPROVE Representative Site	IMPROVE Site Identifier	State	Number of Years of Complete Data	1998-2002 Baseline Visibility (in dv) 20% Best Days	1998-2002 Baseline Visibility (in dv) 20% Worst Days
Red Rock Lakes	Yellowstone	YELL	WY	4	3.7	12.1
Redwood	Redwood	REDW	CA	5	5.0	16.5
Rocky Mountain	Rocky Mountain	ROMO	CO	5	3.7	14.1
Salt Creek	Salt Creek	SACR	NM	2	8.3	17.7
San Gorgonio	San Gorgonio	SAGO	CA	4	6.8	21.5
San Jacinto	San Gorgonio	SAGO	CA	4	6.8	21.5
San Pedro Parks	San Pedro Parks	SAPE	NM	2	3.5	11.4
Sawtooth	Sawtooth	SAWT	ID	2	4.3	13.6
Scapegoat	Monture	MONT	MT	2	4.5	14.2
Selway - Bitterroot	Sula	SULA	MT	2	3.1	12.3
Sequoia	Sequoia	SEQU	CA	3	8.8	23.5
Sierra Ancha	Sierra Ancha	SIAN	AZ	2	6.8	13.4
South Warner	Lava Beds	LABE	CA	2	3.7	16.6
Strawberry Mountain	Starkey	STAR	OR	2	5.6	19.6
Superstition	Tonto	TONT	AZ	3	7.4	14.7
Sycamore Canyon	Sycamore Canyon	SYCA	AZ	2	6.7	16.1
Teton	Yellowstone	YELL	WY	4	3.7	12.1
Theodore Roosevelt	Theodore Roosevelt	THRO	ND	2	7.8	17.6
Thousand Lakes	Lassen Volcanic	LAVO	CA	5	3.3	14.8
Three Sisters	Three Sisters	THSI	OR	5	2.8	15.7
UL Bend	UL Bend	ULBE	MT	2	4.6	14.7
Weminuche	Weminuche	WEMI	CO	4	4.4	11.6
West Elk	White River	WHRI	CO	2	2.8	11.3
Wind Cave	Wind Cave	WICA	SD	3	5.7	16.0
Yellowstone	Yellowstone	YELL	WY	4	3.7	12.1
Yolla Bolly - Middle Eel	Trinity	TRIN	CA	1	3.5	17.1
Yosemite	Yosemite	YOSE	CA	5	4.0	17.6
Zion	Zion	ZION	UT	2	5.4	13.5

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 concentrations 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 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 final rule. The SMAT procedures, as applied for PM2.5 attainment calculations, have been updated to account for explicit differences between the FRM monitors and the speciation monitors. Additional details on the SMAT procedure are provided in the NFR-AQMTSD, Appendix E. In contrast, the procedures for calculating visibility impairment *have not* been changed since the CAIR SNPR. As Stated above, the PM2.5 species definitions and visibility formulas remain consistent with the IMPROVE procedure as defined in the Tracking Guidance. Therefore, there are now major differences in the definition of the PM2.5 species for the purposes of calculating future year PM2.5 (for the purpose of defining attainment status), and the definition of PM2.5 species for the purpose of calculating visibility impairment. The calculations are made for different purposes. The visibility calculations use the IMPROVE data and it is therefore logical to maintain consistency with the IMPROVE visibility calculation procedures. The FRM PM2.5 monitors use a different technology to measure PM2.5 mass. The FRM monitors do not measure and retain the same mass (or species) as the IMPROVE monitors. It is therefore logical to treat the measured data in different ways, for different purposes.

The basic steps in the visibility impairment calculation are detailed below:

Step 1. Calculate light extinction[19] on the 20% worst and best days for each of the six

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[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.

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

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 **daily** component-specific RRF[21] (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[22] 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 section below.

B. Air Quality Modeling of Proposed Emissions Reductions

Introduction

In this section we describe the air quality modeling performed to determine the projected impacts on visibility impairment of the CAIR + BART regional SO_2 and NO_x emissions reductions, as well as air quality modeling of the nationwide BART program. The visibility improvements from the proposed CAIR + BART strategy were compared to the nationwide BART visibility improvements, in accordance with the criteria for making "better-than-BART" determinations proposed in 2004 but not yet finalized.

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[20] The model predicted RRFs are calculated on the 20% best and worst days from 2001 based on the 2001 ambient IMPROVE data.

[21] One difference between the draft Regional Haze modeling guidance procedures and those procedures followed here is that the guidance recommends calculating a mean RRF for each specie across all of the 20% worst (best) days. The procedure for the CAIR is to calculate a daily RRF for each specie. This allows a daily deciview value to be calculated and averaged across the 20% worst (best) days. This more closely follows the procedures for calculating current visibility in the Tracking Guidance. Differences between the procedures specified in the Tracking Guidance and the draft Regional Haze Modeling Guidance will need to be resolved before the modeling guidance is finalized.

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

The proposed 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 future baseline 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 NO_x controls on visibility impairment. Modeling for visibility was performed for 2015 to assess the expected effects of the CAIR + BART and nationwide BART controls on projected visibility impairment (compared to the 2015 baseline).

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 + BART and nationwide BART control strategies. Visibility impairment is shown for the 20% best days for the 2015 baseline, the CAIR + BART and the nationwide BART strategies in 2015. Also shown is the average visibility (on the 20% best days) for the 116 Class I areas and the 29 Eastern Class I areas. The last two columns in the table show the results of the two prongs of the proposed better-than-BART test for the 20% best days.

Under the degradation test (1st prong), there should be no degradation from the CAIR trading program compared to the 2015 baseline. The "degradation test" column shows the results of subtracting the 2015 baseline visibility values from the 2015 CAIR+ BART values. In order to pass this test, all values in the degradation test column should be zero or negative.[23] Under the greater improvement test (2nd prong), the average visibility improvement at all affected Class I areas should be larger under the CAIR + BART program compared to the nationwide BART program. In the table, the "greater improvement" column shows the results of subtracting the nationwide BART case from the CAIR+ BART case. In order to pass the 2nd prong of the test, the average visibility in the East and/or nationwide should be negative (or

[23] All differences that are < .05 dv were rounded down to 0.0 and are considered to be no degradation. In tables II-2 and II-3, these sites are identified with an † next to the 0.0 in the no degradation-test column. Calculating visibility changes to the nearest tenth of a deciview (rather than the nearest hundredth) is consistent with the practice for implementing the reasonable progress goals under the Regional Haze rule. (See, e.g., Guidelines for Tracking Reasonable Progress, sample calculations in sections 1.8 and 1.11). Therefore, for purposes of the better-than-BART test, we have assumed that changes in visibility of less than 0.05 dv should not be considered degradation.

zero). Note that the greater improvement results are shown individually for all 116 Class I areas. This is to provide additional information. Under the greater improvement test, it is acceptable if some Class I areas show greater improvement under the nationwide BART case, as long as the average improvement under the CAIR + BART case is larger.

Table III-2. **Projected visibility for the 2015 baseline and the 2015 CAIR + BART and nationwide BART strategies on the 20% best days, at 116 Class I areas.**

Class I Areas (IMPROVE Site)	**State**	**[A]** **2015 Baseline Visibility (dv)**	**[B]** **2015 Nationwide BART Control Case Visibility (dv)**	**[C]** **2015 CAIR w/ BART in West Control Case Visibility (dv)**	**No Degradation Test** **=[C] – [A]***	**Greater Improvement Test** **= [C] – [B]***
Acadia	ME	8.2	8.1	8.0	-0.2	-0.1
Boundary Waters Canoe Area	MN	6.2	6.2	6.2	0.0	0.0
Brigantine	NJ	15.0	14.8	14.6	-0.4	-0.2
Caney Creek	AR	11.6	11.2	11.2	-0.3	0.1
Cape Romain	SC	13.4	13.3	13.0	-0.4	-0.2
Chassahowitzka	FL	15.2	14.5	14.6	-0.6	0.2
Dolly Sods	WV	12.6	12.4	11.5	-1.1	-0.8
Everglades	FL	11.3	11.3	11.2	-0.1	0.0
Great Gulf	NH	7.9	7.9	7.9	0.0	0.0
Great Smoky Mountains	TN	14.0	13.6	13.3	-0.8	-0.4
Isle Royale	MI	6.1	6.1	6.1	-0.0	0.0
James River Face	VA	15.4	15.1	14.4	-0.9	-0.6
Joyce Kilmer - Slickrock	NC	14.0	13.6	13.3	-0.8	-0.4
Linville Gorge	NC	11.9	11.7	11.3	-0.6	-0.4
Lye Brook	VT	6.3	6.3	6.3	0.0	0.0
Mammoth Cave	KY	16.0	16.0	15.3	-0.6	-0.6
Mingo	MO	13.7	13.3	13.4	-0.3	0.1
Moosehorn	ME	8.7	8.7	8.7	-0.1	0.0
Okefenokee	GA	15.4	15.2	15.0	-0.4	-0.2
Otter Creek	WV	12.7	12.4	11.5	-1.3	-0.9
Presidential Range - Dry	NH	7.7	7.6	7.6	-0.1	0.0
Roosevelt Campobello	ME	8.7	8.6	8.6	-0.1	-0.1
Seney	MI	6.3	6.2	6.3	0.0	0.0
Shenandoah	VA	12.1	11.5	10.8	-1.3	-0.7
Sipsey	AL	16.0	15.8	15.4	-0.6	-0.4

Class I Areas (IMPROVE Site)	State	[A] 2015 Baseline Visibility (dv)	[B] 2015 Nationwide BART Control Case Visibility (dv)	[C] 2015 CAIR w/ BART in West Control Case Visibility (dv)	No Degradation Test =[C] – [A]*	Greater Improvement Test = [C] – [B]*
Swanquarter	NC	12.2	12.1	11.9	-0.2	-0.1
Upper Buffalo	AR	11.8	11.5	11.5	-0.3	0.0
Voyageurs	MN	6.5	6.5	6.5	0.0	0.0
Wolf Island	GA	15.5	15.3	15.2	-0.3	-0.1
Eastern Class I Areas Average		**11.5**	**11.3**	**11.1**	**N/A**	**-0.2**
Agua Tibia	CA	10.1	10.1	10.1	0.0	0.0
Alpine Lakes	WA	5.6	5.5	5.5	-0.1	0.0
Anaconda - Pintler	MT	3.1	3.1	3.1	0.0	0.0
Arches	UT	5.4	5.3	5.3	0.0	0.0
Badlands	SD	6.8	6.7	6.7	-0.1	-0.1
Bandelier	NM	6.3	6.2	6.2	-0.1	0.0
Big Bend	TX	7.7	7.7	7.6	-0.1	-0.1
Black Canyon of the Gunnison	CO	4.2	4.2	4.2	0.0	0.0
Bob Marshall	MT	4.4	4.4	4.4	0.0	0.0
Bridger	WY	3.6	3.5	3.5	0.0	0.0
Bryce Canyon	UT	4.0	4.0	4.0	0.0	0.0
Cabinet Mountains	MT	4.0	4.0	4.0	0.0	0.0
Canyonlands	UT	5.4	5.3	5.3	-0.1	0.0
Caribou	CA	3.3	3.3	3.3	0.0	0.0
Carlsbad Caverns	NM	7.4	7.4	7.4	0.0	0.0
Chiricahua NM	AZ	5.9	5.9	5.9	0.0	0.0
Chiricahua W	AZ	5.9	5.9	5.9	0.0	0.0
Craters of the Moon	ID	4.9	4.9	4.9	0.0†	0.0
Desolation	CA	3.7	3.7	3.7	0.0	0.0
Dome Land	CA	6.0	6.0	6.0	0.0	0.0
Eagle Cap	OR	5.3	5.3	5.3	0.0	0.0
Eagles Nest	CO	2.8	2.7	2.7	0.0	0.0
Emigrant	CA	4.1	4.1	4.1	0.0	0.0
Fitzpatrick	WY	3.6	3.5	3.5	0.0	0.0
Flat Tops	CO	2.7	2.7	2.7	0.0	0.0
Galiuro	AZ	6.1	6.1	6.1	0.0	0.0
Gates of the Mountains	MT	2.9	2.9	2.9	0.0	0.0

Class I Areas (IMPROVE Site)	State	[A] 2015 Baseline Visibility (dv)	[B] 2015 Nationwide BART Control Case Visibility (dv)	[C] 2015 CAIR w/ BART in West Control Case Visibility (dv)	No Degradation Test =[C] – [A]*	Greater Improvement Test = [C] – [B]*
Gila	NM	5.3	5.3	5.3	0.0	0.0
Glacier	MT	6.9	6.9	6.9	0.0	0.0
Glacier Peak	WA	2.5	2.5	2.5	0.0	0.0
Grand Teton	WY	3.6	3.6	3.6	0.0	0.0
Great Sand Dunes	CO	5.6	5.6	5.6	0.0	0.0
Guadalupe Mountains	TX	7.4	7.4	7.4	0.0	0.0
Hells Canyon	OR	5.2	5.2	5.2	0.0	0.0
Jarbidge	NV	3.0	3.0	3.0	-0.1	0.0
Joshua Tree	CA	7.3	7.3	7.3	0.0†	0.0
Kalmiopsis	OR	4.9	4.9	4.9	0.0	0.0
Kings Canyon	CA	9.4	9.4	9.4	0.0	0.0
La Garita	CO	4.3	4.3	4.3	0.0	0.0
Lassen Volcanic	CA	3.3	3.3	3.3	0.0	0.0
Lava Beds	CA	3.7	3.7	3.7	0.0	0.0
Lostwood	ND	8.0	7.9	7.9	0.0	0.0
Marble Mountain	CA	3.6	3.6	3.6	0.0	0.0
Maroon Bells - Snowmass	CO	2.7	2.6	2.6	0.0	0.0
Mazatzal	AZ	6.4	6.4	6.4	0.0†	0.0
Medicine Lake	MT	7.1	7.1	7.1	0.0	0.0
Mesa Verde	CO	5.5	5.5	5.5	0.0	0.0
Mission Mountains	MT	4.0	4.0	4.0	0.0	0.0
Mokelumne	CA	3.6	3.6	3.6	0.0	0.0
Mount Hood	OR	2.6	2.6	2.6	0.0	0.0
Mount Jefferson	OR	2.7	2.7	2.7	0.0	0.0
Mount Rainier	WA	6.8	6.8	6.8	0.0	0.0
Mount Washington	OR	3.3	3.3	3.3	0.0	0.0
Mount Zirkel	CO	4.4	4.3	4.3	0.0	0.0
North Cascades	WA	2.8	2.8	2.8	0.0	0.0
Pasayten	WA	2.5	2.5	2.5	0.0	0.0
Petrified Forest	AZ	6.4	6.3	6.3	-0.1	0.0
Pine Mountain	AZ	6.4	6.4	6.4	0.0	0.0
Rawah	CO	4.4	4.3	4.3	-0.1	0.0

Class I Areas (IMPROVE Site)	State	[A] 2015 Baseline Visibility (dv)	[B] 2015 Nationwide BART Control Case Visibility (dv)	[C] 2015 CAIR w/ BART in West Control Case Visibility (dv)	No Degradation Test =[C] – [A]*	Greater Improvement Test = [C] – [B]*
Red Rock Lakes	WY	3.7	3.6	3.6	0.0	0.0
Redwood	CA	5.5	5.5	5.5	0.0	0.0
Rocky Mountain	CO	3.8	3.8	3.8	0.0	0.0
Salt Creek	NM	8.1	8.0	7.9	-0.1	0.0
San Gorgonio	CA	6.9	6.9	6.9	0.0	0.0
San Jacinto	CA	6.8	6.8	6.8	0.0	0.0
San Pedro Parks	NM	3.5	3.5	3.5	0.0	0.0
Sawtooth	ID	4.2	4.2	4.2	0.0	0.0
Scapegoat	MT	4.3	4.3	4.3	0.0	0.0
Selway - Bitterroot	MT	3.1	3.1	3.1	0.0	0.0
Sequoia	CA	9.0	9.0	9.0	0.0	0.0
Sierra Ancha	AZ	7.2	7.2	7.2	0.0†	0.0
South Warner	CA	3.7	3.7	3.7	0.0	0.0
Strawberry Mountain	OR	5.4	5.4	5.4	0.0	0.0
Superstition	AZ	7.5	7.5	7.5	0.0	0.0
Sycamore Canyon	AZ	6.9	6.8	6.8	0.0	0.0
Teton	WY	3.6	3.6	3.6	0.0	0.0
Theodore Roosevelt	ND	7.5	7.5	7.5	-0.1	0.0
Thousand Lakes	CA	3.3	3.3	3.3	0.0	0.0
Three Sisters	OR	3.3	3.3	3.3	0.0	0.0
UL Bend	MT	4.3	4.3	4.3	0.0	0.0
Weminuche	CO	4.3	4.3	4.3	0.0	0.0
West Elk	CO	2.7	2.6	2.6	0.0	0.0
Wind Cave	SD	5.5	5.4	5.4	-0.1	-0.1
Yellowstone	WY	3.7	3.7	3.7	0.0	0.0
Yolla Bolly - Middle Eel	CA	3.5	3.5	3.5	0.0	0.0
Yosemite	CA	4.0	4.0	4.0	0.0	0.0
Zion	UT	5.4	5.3	5.3	0.0	0.0
All Class I Areas Average		**6.6**	**6.5**	**6.5**	**N/A**	**-0.1**

* Values in “test” columns are derived by subtracting values in appropriate columns before those have been rounded to the nearest 0.1 dv, and then rounding the result. Thus apparent discrepancies are due to rounding. Negative numbers indicate visibility improvement.
† The test result at these Class I areas was a decline of less than 0.05 deciviews, which when rounded equals 0.0. No other Class I areas were projected to decline by any amount.

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 the 2015 baseline conditions, at any of the 116 Class I areas considered. In each of the 116 areas – the 25 within the CAIR region and the 91 outside of it – visibility is expected to improve 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 + BART emissions reductions in the East produce greater visibility improvements than nationwide BART. Specifically, for the 29 Eastern Class I areas analyzed, the average visibility improvement (on the 20 percent best days) expected as a result of the CAIR + BART is 0.4 deciviews (dv), and the average degree of improvement predicted for nationwide BART is 0.2 dv. The "Greater Improvement Test" column in table III-2 reflects the average 0.2 dv greater reduction from CAIR + BART in the East.

On a national basis, the visibility modeling shows that for the 116 class I areas evaluated, the average visibility improvement, on the 20 percent best days, in 2015 was 0.1 dv under the proposed CAIR cap-and-trade programs, and also 0.1 dv under the source-specific BART approach[24] Both programs achieve a small, but essentially equal improvement in average visibility on the 20% best days.

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 + BART and nationwide BART control strategies. Visibility impairment is shown for the 20% worst days for the 2015 baseline, the CAIR + BART and the nationwide BART strategies in 2015. Also shown is the average visibility (on the 20% worst days) for the 116 Class I areas and the 29 Eastern Class I areas. The last two columns in the table show the results of the 2 prongs of the better than BART test for the 20% worst days.

As in table III-2 above, the "degradation test" column shows the results of subtracting the 2015 baseline values from the 2015 CAIR+ BART visibility values and the "greater improvement" column shows the results of subtracting the nationwide BART case from the CAIR+ BART case. In order to pass the1st prong of the test, all values in the degradation test column should be zero or negative. In order to pass the 2nd prong of the test, the average visibility in the East and/or nationwide should be negative (or zero).

[24] The CAIR + BART improvement in visibility was slightly larger than for the nationwide BART case (by 0.05 dv). Because of rounding, table II-2 reports a 0.1 dv greater visibility improvement, averaged across all Class I areas, from CAIR + BART.

Table III-3- Projected Visibility for the 2015 Baseline and the 2015 CAIR and BART Strategies on the 20% Worst Days, at 116 Improve Sites.

Class I Areas (IMPROVE Site)	State	[A] 2015 Baseline Visibility (dv)	[B] 2015 Nationwide BART Control Case Visibility (dv	[C] 2015 CAIR w/ BART in West Control Case Visibility (dv)	No Degradation Test = [C] – [A]*	Greater Improvement Test = [C] – [B]*
Acadia	ME	22.0	21.6	21.0	-1.0	-0.6
Boundary Waters Canoe Area	MN	19.3	19.0	18.9	-0.4	-0.1
Brigantine	NJ	27.4	26.4	25.3	-2.1	-1.1
Caney Creek	AR	25.4	24.5	24.0	-1.3	-0.5
Cape Romain	SC	25.3	24.4	23.9	-1.4	-0.5
Chassahowitzka	FL	24.6	23.1	23.0	-1.7	-0.1
Dolly Sods	WV	26.7	26.1	23.9	-2.8	-2.2
Everglades	FL	19.7	19.3	19.2	-0.5	-0.2
Great Gulf	NH	22.8	22.3	21.2	-1.6	-1.0
Great Smoky Mountains	TN	28.7	27.8	26.1	-2.6	-1.7
Isle Royale	MI	20.5	20.1	20.0	-0.5	-0.1
James River Face	VA	27.6	27.0	25.1	-2.5	-1.9
Joyce Kilmer - Slickrock	NC	28.7	27.8	26.1	-2.6	-1.7
Linville Gorge	NC	26.8	26.0	24.6	-2.1	-1.4
Lye Brook	VT	23.2	22.4	21.1	-2.1	-1.3
Mammoth Cave	KY	29.5	29.4	27.1	-2.4	-2.3
Mingo	MO	26.9	26.6	25.8	-1.0	-0.7
Moosehorn	ME	21.2	20.8	20.3	-0.9	-0.5
Okefenokee	GA	26.1	25.2	24.7	-1.4	-0.5
Otter Creek	WV	27.0	26.3	24.0	-2.9	-2.3
Presidential Range - Dry	NH	22.6	22.0	20.8	-1.8	-1.2
Roosevelt Campobello	ME	21.0	20.6	20.1	-0.9	-0.5
Seney	MI	23.4	22.9	22.6	-0.8	-0.3
Shenandoah	VA	26.7	25.9	23.4	-3.3	-2.5
Sipsey	AL	28.1	27.1	26.1	-2.0	-1.0
Swanquarter	NC	23.8	22.9	21.9	-1.9	-0.9
Upper Buffalo	AR	25.1	24.2	24.1	-0.9	-0.1
Voyageurs	MN	17.7	17.5	17.4	-0.3	-0.1
Wolf Island	GA	26.1	25.3	24.9	-1.1	-0.4
Eastern Class I Areas Average		**24.6**	**23.9**	**23.0**	**N/A**	**-1.0**
Agua Tibia	CA	23.3	23.2	23.2	0.0	0.0

Class I Areas (IMPROVE Site)	State	[A] 2015 Baseline Visibility (dv)	[B] 2015 Nationwide BART Control Case Visibility (dv	[C] 2015 CAIR w/ BART in West Control Case Visibility (dv)	No Degradation Test = [C] – [A]*	Greater Improvement Test = [C] – [B]*
Alpine Lakes	WA	17.4	17.4	17.4	0.0	0.0
Anaconda - Pintler	MT	12.2	12.1	12.1	0.0	0.0
Arches	UT	12.1	12.0	12.0	-0.1	0.0
Badlands	SD	16.9	16.6	16.4	-0.5	-0.1
Bandelier	NM	13.2	13.1	13.1	-0.1	0.0
Big Bend	TX	18.4	18.3	18.2	-0.2	-0.1
Black Canyon of the Gunnison	CO	11.4	11.3	11.3	-0.1	0.0
Bob Marshall	MT	14.0	14.0	14.0	0.0	0.0
Bridger	WY	11.3	11.2	11.2	-0.1	0.0
Bryce Canyon	UT	11.9	11.8	11.8	-0.1	0.0
Cabinet Mountains	MT	13.5	13.4	13.4	0.0	0.0
Canyonlands	UT	12.0	11.9	11.9	-0.1	0.0
Caribou	CA	14.6	14.6	14.6	0.0	0.0
Carlsbad Caverns	NM	17.8	17.7	17.8	0.0†	0.1
Chiricahua NM	AZ	14.0	13.9	13.9	-0.2	0.0
Chiricahua W	AZ	14.0	13.9	13.9	-0.2	0.0
Craters of the Moon	ID	14.7	14.6	14.6	-0.1	0.0
Desolation	CA	12.8	12.8	12.8	0.0	0.0
Dome Land	CA	19.9	19.9	19.9	0.0	0.0
Eagle Cap	OR	19.0	19.0	19.0	-0.1	0.0
Eagles Nest	CO	11.4	11.3	11.3	-0.1	0.0
Emigrant	CA	17.4	17.4	17.3	0.0	0.0
Fitzpatrick	WY	11.3	11.2	11.2	-0.1	0.0
Flat Tops	CO	11.4	11.5	11.5	0.0†	0.0
Galiuro	AZ	14.2	14.1	14.0	-0.1	0.0
Gates of the Mountains	MT	10.8	10.8	10.8	0.0	0.0
Gila	NM	13.6	13.5	13.5	-0.2	0.0
Glacier	MT	19.1	19.1	19.1	0.0	0.0
Glacier Peak	WA	13.8	13.8	13.8	0.0	0.0
Grand Teton	WY	12.0	12.0	12.0	0.0	0.0
Great Sand Dunes	CO	13.0	12.9	12.9	-0.1	0.0
Guadalupe Mountains	TX	17.6	17.5	17.4	-0.2	0.0
Hells Canyon	OR	18.0	18.0	18.0	0.0	0.0

Class I Areas (IMPROVE Site)	State	[A] 2015 Baseline Visibility (dv)	[B] 2015 Nationwide BART Control Case Visibility (dv	[C] 2015 CAIR w/ BART in West Control Case Visibility (dv)	No Degradation Test = [C] – [A]*	Greater Improvement Test = [C] – [B]*
Jarbidge	NV	12.8	12.8	12.8	0.0	0.0
Joshua Tree	CA	20.4	20.3	20.3	0.0	0.0
Kalmiopsis	OR	14.4	14.4	14.3	0.0	0.0
Kings Canyon	CA	24.2	24.1	24.1	-0.1	0.0
La Garita	CO	11.5	11.5	11.4	-0.1	0.0
Lassen Volcanic	CA	14.6	14.6	14.6	0.0	0.0
Lava Beds	CA	16.5	16.5	16.5	0.0	0.0
Lostwood	ND	18.7	18.5	18.5	-0.2	-0.1
Marble Mountain	CA	16.8	16.8	16.8	0.0	0.0
Maroon Bells - Snowmass	CO	11.3	11.2	11.2	-0.1	0.0
Mazatzal	AZ	13.5	13.5	13.5	-0.1	0.0
Medicine Lake	MT	17.1	17.0	17.0	-0.1	0.0
Mesa Verde	CO	12.8	12.7	12.7	-0.1	0.0
Mission Mountains	MT	14.0	14.0	14.0	0.0	0.0
Mokelumne	CA	12.8	12.8	12.8	0.0	0.0
Mount Hood	OR	13.7	13.7	13.7	-0.1	0.0
Mount Jefferson	OR	15.2	15.1	15.1	0.0	0.0
Mount Rainier	WA	19.4	19.4	19.3	-0.1	0.0
Mount Washington	OR	15.2	15.1	15.1	0.0	0.0
Mount Zirkel	CO	11.8	11.8	11.9	0.0†	0.0
North Cascades	WA	14.0	14.0	14.0	0.0	0.0
Pasayten	WA	14.5	14.5	14.5	-0.1	0.0
Petrified Forest	AZ	13.8	13.7	13.7	-0.1	0.0
Pine Mountain	AZ	13.5	13.4	13.4	-0.1	0.0
Rawah	CO	11.7	11.6	11.6	-0.1	0.0
Red Rock Lakes	WY	12.1	12.1	12.1	0.0	0.0
Redwood	CA	16.5	16.5	16.5	0.0	0.0
Rocky Mountain	CO	14.1	14.0	14.0	-0.1	0.0
Salt Creek	NM	17.5	17.3	17.2	-0.3	-0.1
San Gorgonio	CA	22.1	22.1	22.1	-0.1	0.0
San Jacinto	CA	21.4	21.3	21.3	-0.1	0.0
San Pedro Parks	NM	11.5	11.5	11.5	0.0	0.0
Sawtooth	ID	13.5	13.4	13.4	0.0	0.0

Class I Areas (IMPROVE Site)	State	[A] 2015 Baseline Visibility (dv)	[B] 2015 Nationwide BART Control Case Visibility (dv	[C] 2015 CAIR w/ BART in West Control Case Visibility (dv)	No Degradation Test = [C] – [A]*	Greater Improvement Test = [C] – [B]*
Scapegoat	MT	14.1	14.1	14.1	0.0	0.0
Selway - Bitterroot	MT	12.1	12.1	12.1	0.0	0.0
Sequoia	CA	24.1	24.1	24.1	0.0	0.0
Sierra Ancha	AZ	13.7	13.7	13.7	0.0	0.0
South Warner	CA	16.5	16.5	16.5	0.0	0.0
Strawberry Mountain	OR	19.2	19.1	19.1	0.0	0.0
Superstition	AZ	15.0	14.9	14.9	-0.1	0.0
Sycamore Canyon	AZ	16.6	16.6	16.6	0.0	0.0
Teton	WY	12.1	12.1	12.1	0.0	0.0
Theodore Roosevelt	ND	16.9	16.7	16.7	-0.2	0.0
Thousand Lakes	CA	14.6	14.6	14.6	0.0	0.0
Three Sisters	OR	15.2	15.1	15.1	0.0	0.0
UL Bend	MT	14.1	14.0	14.0	-0.1	0.0
Weminuche	CO	11.5	11.4	11.3	-0.1	0.0
West Elk	CO	11.3	11.3	11.2	0.0	0.0
Wind Cave	SD	15.4	15.3	15.2	-0.3	-0.1
Yellowstone	WY	12.1	12.1	12.1	0.0	0.0
Yolla Bolly - Middle Eel	CA	16.9	16.9	16.9	0.0	0.0
Yosemite	CA	17.4	17.4	17.4	0.0	0.0
Zion	UT	13.3	13.2	13.2	-0.1	0.0
All Class I Areas Average		**17.4**	**17.2**	**16.9**	**N/A**	**-0.3**

* Values in “test” columns are derived by subtracting values in appropriate columns before those have been rounded to the nearest 0.1 dv, and then rounding the result. Thus apparent discrepancies are due to rounding. Negative numbers indicate visibility improvement.

† The test result at these Class I areas was a decline of less than 0.05 deciviews, which when rounded equals 0.0 dv. No other Class I areas were projected to decline by any amount.

The modeling results show that the CAIR cap-and-trade program, in conjunction with BART in non-CAIR States, 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 116 Class I areas considered. In each of the 116 areas – the 25 within the proposed CAIR region and the 91 outside of it – visibility is expected to improve compared to 2015 baseline visibility or at worst remain unchanged. Based on these results, and those presented in the previous table, we believe the CAIR impact on emissions passes the first prong of the proposed 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 East, our analysis indicates that proposed CAIR (with BART in the West) emissions reductions produce significantly greater visibility improvements than would nationwide BART. For the 29 Eastern Class I areas analyzed, the average visibility improvement from 2015 baseline (on the 20 percent worst days) expected as a result of the CAIR + BART is 1.6 deciviews (dv),[25] and the average degree of improvement from 2015 baseline predicted for BART alone (i.e., source specific BART nationwide) is 0.7 dv.[26] Therefore, the proposed CAIR makes substantially more improvement than BART – indeed, the proposed CAIR provides more than twice the visibility improvement benefits for Eastern Class I areas.

Similarly, for Class I Areas nationwide, the visibility modeling shows that for the 116 class I areas evaluated, the average visibility improvement, on the 20 percent worst days in 2015 was 0.5 dv under the CAIR cap-and-trade program,[27] but only 0.2 dv under the nationwide BART approach.[28] Based on these results, the proposed CAIR passes the second prong of the proposed 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 CAIR + BART scenario compared to nationwide BART on the 20% best and 20% worst visibility days.

2. Summary of Results under Proposed Better-than-BART Test

Section I demonstrated that emission reductions under CAIR, in conjunction with BART reductions outside the CAIR region, would be substantially greater than under BART alone, according to the presumptive BART standards proposed in April 2004. Section II demonstrated how the air quality modeling of those CAIR (plus BART outside the CAIR region) emission reductions would satisfy the proposed two pronged "better-than-BART" test for those cases in which the distribution of emission reductions may differ from what they would be under source-specific BART.

Specifically, we believe the impact of the proposed CAIR on emissions passes the first prong of the proposed 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 proposed better-than-BART test based on the expectation that :(a) for the Eastern Class I areas visibility improvement is greater on average for the both the 20% best and 20% worst days under the proposed CAIR compared to BART, and (b) for all Class I areas nationally, visibility improvement is essentially equal on the best 20% days, and greater on

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[25] 2015 CAIR projection = 23.0 dv, vs. 2015 baseline of 24.6 dv.

[26] 2015 BART projection = 23.9 dv, vs 2015 baseline of 24.6 dv.

[27] 2015 CAIR projection = 16.9 dv, vs 2015 baseline of 17.4 dv.

[28] 2015 BART projection = 17.2 dv, vs 2015 baseline of 17.4 dv.

the worst 20% days, under the proposed CAIR compared to BART.[29]

[29] Under the Regional Haze Rule, reasonable progress goals are defined in terms of improvement on the worst 20% days, and no degradation on the 20% best days. The proposed better-than-BART test does not specify whether each prong should apply on both best and worst days. For purposes of this analysis, as previously noted, we have considered both the best days and the worst days under both the no-degradation prong and the overall-improvement prong, without determining that all subsequent better-than-BART demonstrations must do so. Similarly, the fact that we have considered all Class I areas nationwide in our analysis does not imply that any future better-than-BART demonstration must necessarily consider all Class I areas in the nation to be "impacted" by the particular BART-alternative under consideration.

Appendix A

Memo From Perrin Quarles Associates, Inc.
Re Follow-Up on Units Potentially Affected by BART
July 19, 2004

PERRIN QUARLES ASSOCIATES, INC.
675 PETER JEFFERSON PARKWAY, SUITE 200
CHARLOTTESVILLE, VIRGINIA 22911
VOICE: (434) 979-3700 • FAX: (434) 296-2860
EMAIL: pqa@pqa.com

MEMORANDUM

TO: Roman Kramarchuk

FROM: Doran Stegura

RE: Follow-Up on Units Potentially Affected by BART

DATE: July 19, 2004

On March 24, 2003, PQA delivered an analysis of sources that may be subject to controls under EPA's Proposed Guidelines for Best Available Retrofit Technology (BART) Determinations. This analysis provided a list of BART units, additional information on the location and control technologies for each unit, and control cost information. The March 2003 analysis only focused on the units for which construction was started by August 7, 1977 and that were not in operation prior to August 7, 1962. Based on EPA guidance, the original analysis also assumed that BART-eligible units are only those that are located at a plant where the total capacity of all units within the BART timeframe exceeds 750 MW.

This follow-up analysis provided additional information on units that are below the 750 MW threshold, but that are potentially within the specified BART timeframe. The approach and assumptions used to identify whether units below the 750 MW threshold could potentially be BART-eligible are consistent with the March 2003 analysis. The units that required additional follow-up research in this regard are those with an online date on or after 1979 since the BART rule could apply if construction on these units commenced prior to August 7, 1977. It was assumed that units with a 1977 or 1978 online date started construction prior to the 1977 cutoff and thus, are considered to be within the BART timeframe. Hunter, unit 1 (UT) is the only exception since it has a PSD permit with an online date of 1978. For the units in question, PQA reviewed the RACT/BACT/LAER Clearinghouse and other internet search information and contacted the appropriate State environmental agencies to verify when the construction permit was issued. Note that the date the construction permit was issued is used as an indication of when construction began for purposes of this analysis. However, actual construction on these units may have started well after the date the permit was issued.

In evaluating the list of units below the 750 MW threshold and with an online date in 1979 or later, PQA assumed that: 1) units subject to Part 60, Subpart D cannot be excluded because this NSPS subpart applies to sources that have started construction after August 17, 1971; 2) units subject to NSPS Subpart Da requirements are outside the applicable BART time period since these requirements apply to sources that started construction after September 18, 1978; and 3) units that received a PSD permit (with a BACT requirement) are outside the BART time period. If a PSD permit was issued, PQA researched the issue date in order to confirm that the unit is outside the BART time period.

Using the above assumptions, a list of 61 units was compiled that required follow-up with the State environmental agency to confirm whether construction began prior to August 7, 1977. Of these 61 units, 43 are located in States covered under the Clean Air InterState Rule (CAIR) and 18 are located in States not covered under CAIR. Per EPA guidance, initial priority was given to those units not located in a State affected by CAIR. Follow-up with the State environmental agencies revealed that of the 61 units that required follow-up, 24 units are within the BART time period, 24 units are outside the BART time period, and 13 units require further follow-up since the State environmental agency was not able to provide the information needed to determine whether the unit started construction prior to August 7, 1977.

Table 1 summarizes the 61 units analyzed by PQA. The table provides an indication of whether the unit is located in a State affected by CAIR, whether the unit has been identified as within the BART timeframe, and whether additional follow-up with the State agency for information on construction permit dates is required to determine BART eligibility.

Table 1: Potential BART Units Identified for Follow-Up Analysis

State	Plant Name	ORIS Code	Unit ID	Online	NSPS	CAIR	In BART timeframe?	Follow-up Needed	Nameplate (MW)
AL	Charles R Lowman	56	2	1979	D	X	X		233
AL	Charles R Lowman	56	3	1980	D	X	X		233
AZ	Apache Station	160	2	1979	D		X		194.7
AZ	Apache Station	160	3	1979	D		X		194.7
AZ	Springerville	8223	1	1985	D				397
AZ	Springerville	8223	2	1990	D				397
CO	Pawnee	6248	1	1981	D			X	500
CO	Ray D Nixon	8219	1	1980	D		X		207
DE	Indian River	594	4	1980	D	X	X		442.4
FL	C D McIntosh	676	3	1982	D	X			334

(cont.)

Table 1: Potential BART Units Identified for Follow-Up Analysis (cont.)

State	Plant Name	ORIS Code	Unit ID	Online	NSPS	CAIR	In BART timeframe?	Follow-up Needed	Nameplate (MW)
FL	Deerhaven	663	B2	1981	D	X			250.75
GA	McIntosh (6124)	6124	1	1979	PRE	X	X		177.66
IA	Ames	1122	8	1982	D	X			65
IA	George Neal South	7343	4	1979	D	X	X		639.9
IA	Louisa	6664	101	1983	D	X			738.09
IA	Ottumwa	6254	1	1981	D	X	X		726
IN	A B Brown Generating Station	6137	1	1979	D	X	X		265.23
KS	Nearman Creek	6064	N1	1981	D	X	X		261
KY	East Bend	6018	2	1981	D	X		X	669.28
KY	R D Green	6639	G1	1979	D	X		X	263.7
KY	R D Green	6639	G2	1981	D	X		X	263.7
KY	Trimble County	6071	1	1990	D	X		X	566.1
LA	Dolet Hills	51	1	1986	D	X			720.75
LA	R S Nelson	1393	6	1982	D	X	X		614.6
LA	Rodemacher	6190	2	1982	D	X	X		558
MD	Brandon Shores	602	1	1984	D	X	X		685.08
MD	Brandon Shores	602	2	1991	D	X	X		685.08
MI	Presque Isle	1769	9	1979	D	X	X		90
MI	Wyandotte	1866	7	1982	D	X			73
MN	Clay Boswell	1893	4	1980	D	X	X		558
MO	Iatan	6065	1	1980	D	X	X		725.85
MO	Sikeston	6768	1	1981	D	X	X		261
NC	Elizabethtown Power	10380	UNIT1	1985	D	X			35
NC	Elizabethtown Power	10380	UNIT2	1985	D	X			35
NC	Lumberton Power	10382	UNIT1	1985	D	X			35
NC	Lumberton Power	10382	UNIT2	1985	D	X			35
NC	Mayo	6250	1A	1983	D	X			735.84
NC	Mayo	6250	1B	1983	D	X			735.84
ND	Antelope Valley	6469	B1	1984	D				435
ND	Antelope Valley	6469	B2	1986	D				435
ND	Coyote	8222	B1	1981	D				450
NE	Gerald Whelan Energy Center	60	1	1981	D				76.3
NE	Nebraska City	6096	1	1979	D		X		615.87
NE	Platte	59	1	1982	D				109.8
NV	North Valmy	8224	1	1981	D			X	254.26
OH	Killen Station	6031	2	1982	D	X	X		666.45
OK	Grand River Dam Authority	165	1	1982	D				490
OK	Hugo	6772	1	1982	D				400
OR	Boardman	6106	1SG	1980	D		X		560.5
TX	Coleto Creek	6178	1	1980	D	X	X		600.39
TX	Gibbons Creek	6136	1	1983	D	X			443.97
TX	Pirkey	7902	1	1985	D	X			720.75
TX	San Miguel	6183	SM-1	1982	D	X			410
TX	Sandow	6648	4	1981	D	X	X		590.64
UT	Hunter (Emery)	6165	1	1978	D			X	446.4
UT	Hunter (Emery)	6165	2	1980	D			X	446.4
WI	Edgewater (4050)	4050	5	1985	D	X		X	380
WI	J P Madgett	4271	B1	1979	D	X		X	387
WI	Pleasant Prairie	6170	1	1980	D	X		X	616.59
WI	Pleasant Prairie	6170	2	1985	D	X		X	616.59
WI	Weston	4078	3	1981	D	X		X	350.46

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Appendix B

Units that were Presumed to be BART-eligible for purposes of Modeling Emissions.

STATE	FACILITY_NAME	UNITID	Online Year	Nameplate Capacity [1]
AL	Barry	4	1969	404
AL	Barry	5	1971	789
AL	Charles R Lowman	1	1969	66
AL	Charles R Lowman	2	1979	233
AL	Charles R Lowman	3	1980	233
AL	Colbert	5	1965	550
AL	E C Gaston	5	1974	952
AL	Gorgas	10	1972	789
AL	Greene County	1	1965	299
AL	Greene County	2	1966	269
AL	James H Miller Jr	1	1978	706
AL	James H Miller Jr	2	1985	706
AL	Widows Creek	8	1965	550
AR	Flint Creek	1	1978	558
AR	Independence	1	1983	850
AR	White Bluff	1	1980	850
AR	White Bluff	2	1981	850
AZ	Apache Station	2	1979	195
AZ	Apache Station	3	1979	195
AZ	Cholla	2	1978	289
AZ	Cholla	3	1980	289
AZ	Cholla	4	1981	414
AZ	Coronado Generating Station	U1B	1979	411
AZ	Coronado Generating Station	U2B	1980	411
AZ	Irvington	4	1967	173
AZ	Navajo Generating Station	1	1974	803
AZ	Navajo Generating Station	2	1975	803
AZ	Navajo Generating Station	3	1976	803
CO	Cherokee	3	1962	150
CO	Cherokee	4	1968	350
CO	Comanche (470)	1	1973	350
CO	Comanche (470)	2	1975	350
CO	Craig	C1	1980	446
CO	Craig	C2	1979	446
CO	Hayden	H1	1965	190
CO	Hayden	H2	1976	275
CO	Martin Drake	5	1962	50
CO	Martin Drake	6	1968	75
CO	Martin Drake	7	1974	132
CO	Pawnee	1	1981	500
CO	Ray D Nixon	1	1980	207
CO	Valmont	5	1964	166
CT	Bridgeport Harbor Station	BHB3	1968	400
DE	Edge Moor	4	1966	177
DE	Indian River	3	1970	177

DE	Indian River	4	1980	442
FL	Big Bend	BB01	1970	446
FL	Big Bend	BB02	1973	446
FL	Big Bend	BB03	1976	446
FL	Crist Electric Generating Plant	6	1970	370
FL	Crist Electric Generating Plant	7	1973	578
FL	Crystal River	1	1966	441
FL	Crystal River	2	1969	524
FL	Crystal River	4	1982	739
FL	Crystal River	5	1984	739
FL	F J Gannon	GB04	1963	187
FL	F J Gannon	GB05	1965	239
FL	F J Gannon	GB06	1967	414
FL	Lansing Smith	1	1965	150
FL	Lansing Smith	2	1967	190
GA	Bowen	1BLR	1971	700
GA	Bowen	2BLR	1972	700
GA	Bowen	3BLR	1974	880
GA	Bowen	4BLR	1975	880
GA	Hammond	4	1970	500
GA	Harllee Branch	1	1965	250
GA	Harllee Branch	2	1967	319
GA	Harllee Branch	3	1968	481
GA	Harllee Branch	4	1969	490
GA	Jack McDonough	MB1	1963	245
GA	Jack McDonough	MB2	1964	245
GA	Kraft	3	1965	104
GA	McIntosh (6124)	1	1979	178
GA	Mitchell	3	1964	125
GA	Scherer	1	1982	818
GA	Scherer	2	1984	818
GA	Wansley (6052)	1	1976	865
GA	Wansley (6052)	2	1978	865
GA	Yates	Y6BR	1974	350
GA	Yates	Y7BR	1974	350
IA	Ames	7	1968	33
IA	Burlington (IA)	1	1968	212
IA	Council Bluffs	3	1978	726
IA	Fair Station	2	1967	38
IA	George Neal North	1	1964	147
IA	George Neal North	2	1972	349
IA	George Neal North	3	1975	550
IA	George Neal South	4	1979	640
IA	Lansing	4	1977	275
IA	Milton L Kapp	2	1967	218
IA	Muscatine	8	1969	75
IA	Ottumwa	1	1981	726
IA	Pella	6	1963	38
IA	Pella	7	1973	38
IA	Prairie Creek	4	1967	149
IA	Sixth Street	2	1970	85

IA	Sixth Street	4	1970	85
IA	Streeter Station	7	1973	35
IL	Baldwin	1	1970	623
IL	Baldwin	2	1973	635
IL	Baldwin	3	1975	635
IL	Coffeen	01	1965	389
IL	Coffeen	02	1972	617
IL	Dallman	31	1968	90
IL	Dallman	32	1972	90
IL	Dallman	33	1978	207
IL	Duck Creek	1	1976	441
IL	E D Edwards	2	1968	281
IL	E D Edwards	3	1972	364
IL	Havana	9	1978	488
IL	Joliet 29	71	1965	660
IL	Joliet 29	72	1965	660
IL	Joliet 29	81	1965	660
IL	Joliet 29	82	1965	660
IL	Kincaid	1	1967	660
IL	Kincaid	2	1968	660
IL	Lakeside	7	1965	38
IL	Lakeside	8	1965	38
IL	Marion	1	1963	33
IL	Marion	2	1963	33
IL	Marion	3	1963	33
IL	Marion	4	1978	173
IL	Newton	1	1977	617
IL	Newton	2	1982	617
IL	Powerton	51	1972	893
IL	Powerton	52	1972	893
IL	Powerton	61	1975	893
IL	Powerton	62	1975	893
IL	Waukegan	8	1962	355
IL	Will County	4	1963	598
IL	Wood River	5	1964	388
IN	A B Brown Generating Station	1	1979	265
IN	Bailly	7	1962	194
IN	Bailly	8	1968	422
IN	Cayuga	1	1970	531
IN	Cayuga	2	1972	531
IN	Dean H Mitchell	11	1970	115
IN	F B Culley Generating Station	2	1966	104
IN	F B Culley Generating Station	3	1973	265
IN	Frank E Ratts	1SG1	1970	117
IN	Frank E Ratts	2SG1	1970	117
IN	Gibson	1	1976	668
IN	Gibson	2	1975	668
IN	Gibson	3	1978	668
IN	Gibson	4	1979	668
IN	Harding Street Station (EW Stout)	70	1973	471
IN	Merom	1SG1	1983	540

IN	Merom	2SG1	1982	540
IN	Michigan City	12	1974	540
IN	Petersburg	1	1967	253
IN	Petersburg	2	1969	471
IN	Petersburg	3	1977	574
IN	R M Schahfer	14	1976	540
IN	R M Schahfer	15	1979	556
IN	State Line Generating Station (IN)	4	1962	389
IN	Tanners Creek	U4	1964	580
IN	Wabash River	6	1968	387
IN	Warrick	2	1964	144
IN	Warrick	3	1965	144
IN	Warrick	4	1970	323
IN	Whitewater Valley	2	1973	60
KS	Jeffrey Energy Center	1	1978	720
KS	Jeffrey Energy Center	2	1980	720
KS	La Cygne	1	1973	893
KS	La Cygne	2	1977	685
KS	Lawrence Energy Center	5	1971	458
KS	Nearman Creek	N1	1981	261
KS	Quindaro	1	1965	82
KS	Quindaro	2	1971	158
KS	Tecumseh Energy Center	10	1962	176
KY	Big Sandy	BSU1	1963	281
KY	Big Sandy	BSU2	1969	816
KY	Cane Run	4	1962	163
KY	Cane Run	5	1966	209
KY	Cane Run	6	1969	272
KY	Coleman	C1	1969	174
KY	Coleman	C2	1970	174
KY	Coleman	C3	1971	173
KY	Cooper	1	1965	100
KY	Cooper	2	1969	221
KY	E W Brown	2	1963	180
KY	E W Brown	3	1971	446
KY	East Bend	2	1981	669
KY	Elmer Smith	1	1964	151
KY	Elmer Smith	2	1974	265
KY	Ghent	1	1974	557
KY	Ghent	2	1977	556
KY	H L Spurlock	1	1977	305
KY	H L Spurlock	2	1981	508
KY	Henderson I	6	1968	32
KY	HMP&L Station 2	H1	1973	180
KY	HMP&L Station 2	H2	1974	185
KY	Mill Creek	1	1972	356
KY	Mill Creek	2	1974	356
KY	Mill Creek	3	1978	463
KY	Mill Creek	4	1982	544
KY	Paradise	1	1963	704
KY	Paradise	2	1963	704

KY	Paradise	3	1970	1150
KY	R D Green	G1	1979	264
KY	R D Green	G2	1981	264
KY	Robert Reid	R1	1965	82
KY	Trimble County	1	1990	566
LA	Big Cajun 2	2B1	1980	559
LA	Big Cajun 2	2B2	1981	559
LA	R S Nelson	6	1982	615
LA	Rodemacher	2	1982	558
MA	Brayton Point	1	1963	241
MA	Brayton Point	2	1964	241
MA	Brayton Point	3	1969	643
MD	Brandon Shores	1	1984	685
MD	Brandon Shores	2	1991	685
MD	C P Crane	2	1963	209
MD	Chalk Point	1	1964	364
MD	Chalk Point	2	1965	364
MD	Dickerson	3	1962	196
MD	Herbert a Wagner	3	1966	359
MD	Morgantown	1	1970	626
MD	Morgantown	2	1971	626
MI	Belle River	1	1984	698
MI	Belle River	2	1985	698
MI	Eckert Station	4	1964	80
MI	Eckert Station	5	1968	80
MI	Eckert Station	6	1970	80
MI	Erickson	1	1973	155
MI	Harbor Beach	1	1968	121
MI	J H Campbell	1	1962	265
MI	J H Campbell	2	1967	385
MI	J H Campbell	3	1980	871
MI	James De Young	5	1969	29
MI	Monroe	1	1971	817
MI	Monroe	2	1973	823
MI	Monroe	3	1973	823
MI	Monroe	4	1974	817
MI	Presque Isle	2	1962	38
MI	Presque Isle	3	1964	54
MI	Presque Isle	4	1966	58
MI	Presque Isle	5	1974	90
MI	Presque Isle	6	1975	90
MI	Presque Isle	7	1978	90
MI	Presque Isle	8	1978	90
MI	Presque Isle	9	1979	90
MI	St. Clair	7	1969	545
MI	Trenton Channel	9A	1968	536
MN	Allen S King	1	1968	598
MN	Clay Boswell	3	1973	365
MN	Clay Boswell	4	1980	558
MN	Hoot Lake	3	1964	75
MN	Northeast Station	NEPP	1971	32

MN	Riverside (1927)	8	1964	239
MN	Sherburne County	1	1976	660
MN	Sherburne County	2	1977	660
MN	Silver Lake	4	1969	54
MO	Asbury	1	1970	232
MO	Blue Valley	3	1965	58
MO	Columbia	7	1965	74
MO	Iatan	1	1980	726
MO	James River	4	1964	60
MO	James River	5	1970	105
MO	Labadie	1	1970	574
MO	Labadie	2	1971	574
MO	Labadie	3	1972	621
MO	Labadie	4	1973	621
MO	Lake Road	6	1970	90
MO	Montrose	3	1964	188
MO	New Madrid	1	1972	600
MO	New Madrid	2	1977	600
MO	Rush Island	1	1976	621
MO	Rush Island	2	1977	621
MO	Sibley	2	1962	50
MO	Sibley	3	1969	419
MO	Sikeston	1	1981	261
MO	Sioux	1	1967	550
MO	Sioux	2	1968	550
MO	Southwest	1	1976	194
MO	Thomas Hill	MB1	1966	180
MO	Thomas Hill	MB2	1969	285
MS	Daniel Electric Generating Plant	1	1977	500
MS	Daniel Electric Generating Plant	2	1981	500
MS	R D Morrow	1	1978	200
MS	R D Morrow	2	1978	200
MS	Watson Electric Generating Plant	4	1968	250
MS	Watson Electric Generating Plant	5	1973	500
MT	Colstrip	1	1975	358
MT	Colstrip	2	1976	358
MT	J E Corette	2	1968	191
NC	Asheville	1	1964	207
NC	Asheville	2	1971	207
NC	Belews Creek	1	1974	1080
NC	Belews Creek	2	1975	1080
NC	Cliffside	5	1972	571
NC	L V Sutton	3	1972	447
NC	Lee	3	1962	252
NC	Marshall	1	1965	350
NC	Marshall	2	1966	350
NC	Marshall	3	1969	648
NC	Marshall	4	1970	648
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
ND	Coal Creek	1	1979	506
ND	Coal Creek	2	1981	506
ND	Leland Olds	1	1966	216
ND	Leland Olds	2	1975	440
ND	Milton R Young	B1	1970	257
ND	Milton R Young	B2	1977	477
ND	R M Heskett	B2	1963	75
ND	Stanton	1	1967	172
NE	Gerald Gentleman Station	1	1979	681
NE	Gerald Gentleman Station	2	1982	681
NE	Lon D Wright Power Plant	8	1976	92
NE	Nebraska City	1	1979	616
NE	North Omaha	4	1963	136
NE	North Omaha	5	1968	218
NE	Sheldon	1	1968	109
NH	Merrimack	2	1968	346
NJ	B L England	1	1962	136
NJ	B L England	2	1964	163
NJ	Hudson	2	1968	660
NM	Four Corners	1	1963	190
NM	Four Corners	2	1963	190
NM	Four Corners	3	1964	253
NM	Four Corners	4	1969	818
NM	Four Corners	5	1970	818
NM	San Juan	1	1976	361
NM	San Juan	2	1973	350
NM	San Juan	3	1979	534
NM	San Juan	4	1982	534
NV	Mohave	1	1971	818
NV	Mohave	2	1971	818
NV	North Valmy	1	1981	254
NV	Reid Gardner	1	1965	114
NV	Reid Gardner	2	1968	114
NV	Reid Gardner	3	1976	114
NY	Dynegy Danskammer	4	1967	239
NY	Lovett	4	1966	180
NY	Lovett	5	1969	201
NY	S A Carlson	12	1963	58
OH	Avon Lake Power Plant	12	1970	680
OH	Bay Shore	3	1963	141
OH	Bay Shore	4	1968	218
OH	Cardinal	1	1967	615
OH	Cardinal	2	1967	615
OH	Cardinal	3	1977	650
OH	Conesville	3	1962	162
OH	Conesville	4	1973	842
OH	Conesville	5	1976	444
OH	Conesville	6	1978	444

OH	Eastlake	5	1972	680
OH	Gen J M Gavin	1	1974	1300
OH	Gen J M Gavin	2	1975	1300
OH	Hamilton	9	1974	51
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
OH	Killen Station	2	1982	666
OH	Lake Shore	18	1962	256
OH	Miami Fort	7	1975	557
OH	Miami Fort	8	1978	558
OH	Muskingum River	5	1968	615
OH	W H Sammis	4	1962	185
OH	W H Sammis	5	1967	318
OH	W H Sammis	6	1969	623
OH	W H Sammis	7	1971	623
OH	Walter C Beckjord	5	1962	245
OH	Walter C Beckjord	6	1969	461
OK	Muskogee	4	1977	572
OK	Muskogee	5	1978	572
OK	Northeastern	3313	1979	473
OK	Northeastern	3314	1980	473
OK	Sooner	1	1979	569
OK	Sooner	2	1980	569
OR	Boardman	1SG	1980	561
PA	Bruce Mansfield	1	1976	914
PA	Bruce Mansfield	2	1977	914
PA	Bruce Mansfield	3	1980	914
PA	Brunner Island	2	1965	405
PA	Brunner Island	3	1969	790
PA	Cheswick	1	1970	565
PA	Conemaugh	1	1970	936
PA	Conemaugh	2	1971	936
PA	Hatfields Ferry	1	1969	576
PA	Hatfields Ferry	2	1970	576
PA	Hatfields Ferry	3	1971	576
PA	Homer City	1	1969	660
PA	Homer City	2	1969	660
PA	Homer City	3	1977	692
PA	Keystone	1	1967	936
PA	Keystone	2	1968	936
PA	Mitchell	33	1963	299
PA	Montour	1	1972	823
PA	Montour	2	1973	819
PA	New Castle	5	1964	136
PA	Portland	2	1962	255
SC	Canadys Steam	CAN1	1962	136
SC	Canadys Steam	CAN2	1964	136
SC	Canadys Steam	CAN3	1967	218
SC	Dolphus M Grainger	1	1966	82

SC	Dolphus M Grainger	2	1966	82
SC	Jefferies	3	1970	173
SC	Jefferies	4	1970	173
SC	Wateree	WAT1	1970	386
SC	Wateree	WAT2	1971	386
SC	Williams	WIL1	1973	633
SC	Winyah	1	1975	315
SC	Winyah	2	1977	315
SD	Big Stone	1	1975	456
TN	Bull Run	1	1967	950
TN	Cumberland	1	1973	1300
TN	Cumberland	2	1973	1300
TX	Big Brown	1	1971	593
TX	Big Brown	2	1972	593
TX	Coleto Creek	1	1980	600
TX	Harrington Station	061B	1976	360
TX	Harrington Station	062B	1978	360
TX	J T Deely	1	1977	446
TX	J T Deely	2	1978	446
TX	Martin Lake	1	1977	793
TX	Martin Lake	2	1978	793
TX	Monticello	1	1974	593
TX	Monticello	2	1975	593
TX	Monticello	3	1978	793
TX	Sam Seymour	1	1979	615
TX	Sam Seymour	2	1980	615
TX	Sandow	4	1981	591
TX	W A Parish	WAP5	1977	734
TX	W A Parish	WAP6	1978	734
TX	Welsh	1	1977	558
TX	Welsh	2	1980	558
TX	Welsh	3	1982	558
UT	Hunter (Emery)	1	1978	446
UT	Hunter (Emery)	2	1980	446
UT	Huntington	1	1977	446
UT	Huntington	2	1974	446
VA	Chesapeake	4	1962	239
VA	Chesterfield	5	1964	359
VA	Chesterfield	6	1969	694
VA	Possum Point Power Station	4	1962	239
WA	Centralia	BW21	1972	730
WA	Centralia	BW22	1973	730
WI	Columbia	1	1975	512
WI	Columbia	2	1978	512
WI	Edgewater (4050)	4	1969	351
WI	Edgewater (4050)	5	1985	380
WI	Genoa	1	1969	346
WI	J P Madgett	B1	1979	387
WI	Manitowoc	7	1962	79
WI	Nelson Dewey	2	1962	114
WI	Pleasant Prairie	1	1980	617

WI	Pleasant Prairie	2	1985	617
WI	Pulliam	8	1964	136
WI	South Oak Creek	7	1965	318
WI	South Oak Creek	8	1967	324
WI	Valley (Wepco)	1	1968	136
WI	Valley (Wepco)	2	1968	136
WI	Valley (Wepco)	3	1969	136
WI	Valley (Wepco)	4	1969	136
WI	Weston	3	1981	350
WV	Fort Martin	1	1967	576
WV	Fort Martin	2	1968	576
WV	Harrison	1	1972	684
WV	Harrison	2	1973	684
WV	Harrison	3	1974	684
WV	John E Amos	1	1971	816
WV	John E Amos	2	1972	816
WV	John E Amos	3	1973	1300
WV	Mitchell	1	1971	816
WV	Mitchell	2	1971	816
WV	Mount Storm Power Station	1	1965	570
WV	Mount Storm Power Station	2	1966	570
WV	Mount Storm Power Station	3	1973	522
WV	Mountaineer (1301)	1	1980	1300
WV	Pleasants	1	1979	684
WV	Pleasants	2	1980	684
WY	Dave Johnston	BW43	1964	230
WY	Dave Johnston	BW44	1972	360
WY	Jim Bridger	BW71	1974	561
WY	Jim Bridger	BW72	1975	561
WY	Jim Bridger	BW73	1976	561
WY	Jim Bridger	BW74	1979	561
WY	Laramie River	1	1980	570
WY	Laramie River	2	1981	570
WY	Laramie River	3	1982	570
WY	Naughton	1	1963	163
WY	Naughton	2	1968	218
WY	Naughton	3	1971	326
WY	Wyodak	BW91	1978	362

[1] Nameplate capacity of generator connected to boiler