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Demonstration that the SO_2 Milestones Provide Greater Reasonable Progress than BART

A. Background

In 1996 the Grand Canyon Visibility Transport Commission (GCVTC) submitted recommendations to EPA to improve visibility in the 16 Class I areas on the Colorado Plateau. The GCVTC concluded that a broad-based approach that addressed multiple pollutants and source categories was necessary to reduce regional haze. The report recommended a series of strategies to address stationary sources, mobile sources, fire, pollution prevention, fugitive dust, and clean air corridors.

On July 1, 1999 the Environmental Protection Agency (EPA) published regulations to address regional haze visibility impairment. The regulations required States to address Best Available Retrofit Technology (BART) requirements for regional haze visibility impairment, and allowed nine western states to develop plans that were based on the GCVTC recommendations for stationary sources in lieu of BART.

In 2000, the Western Regional Air Partnership (WRAP) submitted an Annex to the GCVTC recommendations that provided more details regarding the Regional SO_2 Milestones and Backstop Trading Program that had been recommended in the GCVTC Report, and included a demonstration that the milestones achieved greater reasonable progress than would have been achieved by the application of BART in the region. The Annex was approved by EPA in 2003, but this approval was later vacated by the DC Circuit Court of Appeals in 2005 due to problems with the methodology that was required in the regional haze rule for demonstrating greater reasonable progress than BART.[1]

On July 6, 2005 EPA revised the regional haze rule in response to the judicial challenges to the BART requirements. On October 13, 2006 EPA published additional revisions to address alternatives to source-specific BART determinations.

Five western states (Arizona, New Mexico, Oregon, Utah, and Wyoming) and the City of Albuquerque had submitted State Implementation Plans (SIPs) in 2003 under 40 CFR §51.309. Three of those states (New Mexico, Utah, and Wyoming) and the City of Albuquerque plan to update their SIPs to include new milestones that are based on more recent emission inventories as well as the revised BART requirements in the Regional Haze Rule. Arizona and Oregon are no longer participating in the program. This demonstration shows that the SO_2 milestones will achieve greater reasonable progress than would have been achieved from the installation and operation of BART at all sources subject to BART in the participating states in accordance with the revised Regional Haze Rule.

1 *Center for Energy and Economic Development v. EPA*, February 18, 2005; *American Corn Growers Association v. EPA*, May 24, 2002.

B. RH Rule Requirements

40 CFR 51.309(d)(4) states, "The milestones must be shown to provide for greater reasonable progress than would be achieved by application of BART pursuant to §51.308(e)(2)."

> 40 CFR 51.308(e)
> …(2) A State may opt to implement or require participation in an emissions trading program or other alternative measure rather than to require sources subject to BART to install, operate, and maintain BART. Such an emissions trading program or other alternative measure must achieve greater reasonable progress than would be achieved through the installation and operation of BART. For all such emission trading programs or other alternative measures, the State must submit an implementation plan containing the following plan elements and include documentation for all required analyses:
>
> (i) A demonstration that the emissions trading program or other alternative measure will achieve greater reasonable progress than would have resulted from the installation and operation of BART at all sources subject to BART in the State and covered by the alternative program. This demonstration must be based on the following:
>
> (A) A list of all BART-eligible sources within the State.
>
> (B) A list of all BART-eligible sources and all BART source categories covered by the alternative program. The State is not required to include every BART source category or every BART-eligible source within a BART source category in an alternative program, but each BART-eligible source in the State must be subject to the requirements of the alternative program, have a federally enforceable emission limitation determined by the State and approved by EPA as meeting BART in accordance with section 302(c) or paragraph (e)(1) of this section, or otherwise addressed under paragraphs (e)(1) or (e)(4)of this section.
>
> (C) An analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each source within the State subject to BART and covered by the alternative program. This analysis must be conducted by making a determination of BART for each source subject to BART and covered by the alternative program as provided for in paragraph (e)(1) of this section, unless the emissions trading program or other alternative measure has been designed to meet a requirement other than BART (such as the core requirement to have a long-term strategy to achieve the reasonable progress goals established by States). In this case, the State may determine the best system of continuous emission control technology and associated emission reductions for similar types of sources within a source category based on both source-specific and category-wide information, as appropriate.
>
> (D) An analysis of the projected emissions reductions achievable through the trading program or other alternative measure.
>
> (E) A determination under paragraph (e)(3) of this section or otherwise based on the clear weight of evidence that the trading program or other alternative measure achieves greater reasonable progress than would be achieved through the installation and operation of BART at the covered sources.

C. Identification of BART-Eligible Sources and Sources Subject to BART.

Establishing BART emission limitations under 40 CFR 51.308(e)(1) is a three-step process (70 FR 39106):

- States identify sources which meet the definition of BART eligible
- States determine which BART eligible sources are "subject to BART"
- For each source subject to BART the State identifies the appropriate control technology.

1. BART-Eligible Sources.

Pursuant to 40 CFR 51.308(e)(2)(i), States submitting §309 SIPs are required to list all BART-eligible sources covered by the alternative program. BART-eligible sources are identified as those sources that fall within one of 26 specific source categories, were built between 1962 and 1977, and have potential emissions of at least 250 tons per year of any visibility impairing air pollutant (40 CFR 51.301). The BART-eligible sources identified by the three §309 States are shown in Table 1.

2. Subject to BART Determination.

Pursuant to 40 CFR 51.308(e)(2)(i)(B) and (e)(1)(ii), States are required to determine which BART-eligible sources are "subject to BART." BART-eligible sources are subject to BART if they emit any air pollutant that may reasonably be anticipated to cause or contribute to any impairment of visibility in any mandatory Class I federal area. §309 States have conducted individual source modeling to determine if a BART-eligible source causes or contributes to visibility impairment.

Two of the §309 States (New Mexico and Utah) utilized the technical modeling services of the WRAP Regional Modeling Center (RMC). Modeling was performed according to the RMC modeling protocols (CALMET/CALPUFF Protocol for BART Exemption Screening Analysis for Class I Areas in the Western United States). For the WRAP BART exemption screening modeling, the RMC followed the EPA BART Guidelines (EPA, 2005) and the applicable CALMET/CALPUFF modeling guidance (e.g., IWAQM, 1998; FLAG, 2000; EPA, 2003c) including EPA's March 16, 2006 memorandum: "Dispersion Coefficients for Regulatory Air Quality Modeling in CALPUFF" (Atkinson and Fox, 2006).

The basic assumptions of the WRAP BART CALMET/CALPUFF modeling protocols are as follows.

- Three years (2001, 2002 and 2003) were modeled.
- Visibility impacts due to emissions of SO_2, NO_x and primary PM emissions were calculated.
- Visibility was calculated using the original IMPROVE equation and "Annual Average Natural Conditions".
- The effective range of CALPUFF modeling was set at 300km from the sources.

- According to 40 CFR Part 51, Appendix Y (EPA BART Guidelines; EPA, 2005), a BART-eligible source is considered to "contribute" to visibility impairment in a Class I area if the modeled 98th percentile change in deciviews is equal to or greater than the "contribution threshold."
- The threshold for visibility impact, for a single source, was a 0.5 deciview change or more to "contribute" to visibility impairment. This threshold is consistent with the EPA BART Guidelines (EPA, 2005) that states, "As a general matter, any threshold that you use for determining whether a source 'contributes' to visibility impairment should not be higher than 0.5 deciviews." This threshold is also consistent with long-standing visibility modeling practices. States have the discretion to set a lower threshold, but the three participating states have not determined that a lower threshold is needed or justified.

The State of Wyoming performed modeling in-house that was also based on EPA BART Guidelines and the applicable CALMET/CALPUFF guidelines. The basic assumptions were the same as used in the RMC modeling with the following exception: meteorological data for 1995, 1996, and 2001 that were prepared for a previous modeling analysis were used for the southwest Wyoming modeling domain. Wyoming's *BART Air Modeling Protocol*, September 2006, is posted at http://deq.state.wy.us/aqd/BART.asp.

Table 1. Subject to BART Status for §309 BART-Eligible Sources

State	Plant Name	Unit	BART Eligible	Subject to BART	Modeling Entity	BART Category
NM	Amoco Empire Abo	SRU Only	Y	N	WRAP	15
NM	SWPS Cunningham Station (Xcel Energy)	One Unit	Y	N	WRAP	01
NM	Duke Energy Artesia Gas Plant	SRU Only	Y	N	WRAP	15
NM	Duke Energy Linam Ranch Gas Plant	SRU Only	Y	N	WRAP	15
NM	Dynegy Saunders	SRU Only	Y	N	WRAP	15
NM	Giant Refining San Juan Refinery	Unit #1 FCCP ESP Stack	Y	N	WRAP	11
NM	Giant Refining, Ciniza Refinery	4 B&W CO Boiler	Y	N	WRAP	11
NM	SWPS Maddox Station (Xcel Energy)	One Unit	Y	N	WRAP	01
NM	Marathon Indian Basin Gas Plant	SRU Only	Y	N	WRAP	15
NM	PNM, San Juan	Units 1-4	Y	Y	WRAP	01
NM	Rio Grande Station	One Unit	Y	N	WRAP	01
NM	Western Gas Resources San Juan River Gas Plant	SRU Only	Y	N	WRAP	15
UT	PACIFICORP – Hunter Power Plant	Units 1-2	Y	Y	WRAP	01
UT	PACIFICORP – Huntington Power Plant	Units 1-2	Y	Y	WRAP	01
WY	BASIN ELECTRIC POWER COOP – LARAMIE RIVER	Units 1-3	Y	Y	WY DEQ	01
WY	BLACK HILLS POWER & LIGHT - NEIL SIMPSON I	Unit 1	Y	N	WY DEQ	01
WY	Dyno Nobel (formerly Coastal Chemical)	9 Units	Y	N	WY DEQ	10
WY	FMC CORP – GREEN RIVER SODA ASH PLANT	3 Units	Y	Y	WY DEQ	22

WY	FMC WYOMING CORP – GRANGER SODA ASH PLANT	2 Units	Y	N	WY DEQ	22
WY	GENERAL CHEMICAL – GREEN RIVER SODA ASH PLANT	2 Units	Y	Y	WY DEQ	22
WY	P4 PRODUCTION – ROCK SPRINGS COKING PLANT	1 Unit	Y	N	WY DEQ	22
WY	PACIFICORP – DAVE JOHNSTON	Units 3-4	Y	Y	WY DEQ	01
WY	PACIFICORP – JIM BRIDGER	Units 1-4	Y	Y	WY DEQ	01
WY	PACIFICORP – NAUGHTON	Units 1-3	Y	Y	WY DEQ	01
WY	PACIFICORP –WYODAK	Unit 1 (335 MW)	Y	Y	WY DEQ	01
WY	SINCLAIR OIL CORP-SINCLAIR REFINERY	16 Units	Y	N	WY DEQ	11
WY	SINCLAIR REFINERY – CASPER	1 Unit	Y	N	WY DEQ	11

D. Baseline Inventory for 2018

The Stationary Sources Joint Forum of the WRAP coordinated the development of a baseline inventory for 2018 that was used to update the SO_2 milestones for the 3-state region. The inventory was estimated as described below.

1. Electric Generating Units (EGUs)

The methodology for projecting existing EGUs into the future involves the following steps:

a) the electricity production (MWs) for each individual unit at a plant was determined from the Energy Information Administration [EIA] (data available for 2002-05)

b) the electricity generation design maximum capacity (MWs) was determined for each individual unit from EIA data

c) an operating Capacity Factor was determined by dividing the year specific production by the design maximum capacity of the each individual plant unit

d) all individual units were assumed to be operating at 85% capacity in 2018 (unless they were already operating above this level in 2002)

e) the Growth Ratio necessary to achieve 85% capacity was determined by dividing 0.85 by the Capacity Factor for each individual plant unit (averaged over four years)

f) a Current Year Emission Factor (lb SO_2/MMBtu) was calculated for the latest year of available EIA data (2006), using the actual reported emissions (tons SO_2) for each individual plant unit divided by the actual reported annual heat generation (MMBtu)

g) the 2018 Emission Factor was assumed to be the same as the current emission factor, except for a few sources that had a new permitted emission rate

h) the 2018 Emission Rate (tons SO_2) was calculated by multiplying current year emissions by the ratio of the 2018 to current year Emission Factors

i) the Adjusted 2018 Emission Rate (tons SO_2) was "grown" to 85% capacity by multiplying the 2018 Emission Rate by the Growth Ratio from Step e) (emissions from units already operating at or higher than the 85% capacity in the 2002 data year, were not grown, but accepted at face value)

2. Permitted/Future EGUs

The PRP18b inventory is documented in the ERG Final Technical Memorandum dated October 16, 2009. The Memorandum projects the need for 61.99 billion kWh of future coal-fired electricity generation between 2002 and 2018. Of this total, 36.37 billion kWh will be met by increased utilization of existing plants, and the addition of new plants that are already under construction. The remaining 25.62 billion kWh will be met by new coal plants in the WRAP region. The §309 States estimate that 25% of that total will be constructed in the 3-state region, with an emission estimate of 2,600 tons SO_2 by 2018.

a) Growth Estimates in 2008 SIPs.

The previous SO_2 milestones were finalized by the §309 States in the spring of 2008 and were adopted into the SIPs for Albuquerque, Utah, and Wyoming later that year. The milestones included a new source growth estimate of 20,000 tons SO_2 for utilities. This new source growth estimate was drawn from the PRP18a inventory that relied on the 2007 EIA projections. As part of the technical demonstration for the SIPs, the §309 States identified projects that were under construction or had been permitted that would have consumed about 10,000 tons of the new source set-aside.

b) Changes in Underlying Assumptions.

During the last two years there have been significant changes in the EIA projections for future growth of coal-fired electricity generation. The PRP18b inventory that is documented in the ERG Final Technical Memorandum dated October 16, 2009 has scaled back the projections of growth of coal-fired utilities. EPA has indicated that this more recent information calls into question the estimates for future growth in coal-fired generation in the current milestones. In addition, the State of Arizona has elected to develop a SIP under Section 308 of the Regional Haze Rule, further reducing the new source set-aside.

c) Updated New Source Growth Estimates.

The §309 States have reviewed the new Memorandum and have determined that the new source growth estimate should be reduced from 20,000 tons SO_2 to 6,600 tons SO_2. Of this total, approximately 4,000 tons SO_2 can be attributed to new units in Wyoming that are currently operating, or have commenced construction (Wygen Units II and III, Dry Fork Station, and Two Elk Unit 1). This leaves a remaining estimate of new source growth that has not been attributed to a specific plant of 2,600 tons SO_2.

This estimate is consistent with the 2009 ERG Final Technical Memorandum. As outlined in Table 3 of that Memorandum (summarized below) an additional 61.99 billion kWh of coal-fired electricity generation will be needed between 2002 and 2018.

Future Coal-Fired Electricity Generation (billion kWh)	
258.7	2002 Electricity Generation
320.69	2018 Electricity Generation
61.99	**Needed Generation**

Future Coal-Fired Electricity Generation From Existing Sources, and Those Under Construction (billion kWh)	
16.6	Unused capacity at existing 2002 facilities
5.34	Capacity at post-2002 facilities
14.43	Estimated generation capacity of the 6 EGUs under construction
36.37	**Total**

25.62 New Source Growth Needed in WRAP Region (billion kWh)

As shown above, 36.37 billion kWh can be met by the combination of unused capacity from existing sources plus new sources that are in operation or under construction (including the three plants in Wyoming that are described above). This leaves a remaining 25.62 billion kWh that would be met by new coal plants in the region.

The need for new source growth beyond what is already under construction is supported by estimates of future electricity demand in the region. For example, the Integrated Resource Plan submitted by PacifiCorp to the Utah Public Service Commission in May 2009 estimates a capacity deficit of 3,520 MW by 2018. The IRP meets that deficit through a combination of new natural gas-fired plants, renewable resources, and demand side management and does not include plans for new coal-fired generation. This is a change from the 2006 IRP (submitted in 2007), that included plans for new coal generation in Utah (340 MW) and Wyoming (527 MW) by 2018. However, the 2008 IRP also increased the estimated front office transactions (power purchased on the open market), from 249 MW in the 2006 IRP to 800 MW in the 2008 IRP for the year 2018. Because future demand exceeds existing capacity as shown in Table 3 of the ERG Final Technical Memorandum, it is reasonable to assume that new plants (including potential merchant plants built by other entities) will be needed to meet this demand for purchased power in 2018.

Table 4 in the Final Technical Memorandum identifies 8,880 MW that are being permitted in the region. The Memorandum states, "However, if 39% of the new coal-fired EGU plant capacity currently in the permitting process is brought on-line, then the 2008 coal-fired EIA projection for 2018 will be met." (see page 7). Therefore, the estimate of future coal-fired EGUs in the 12-state region is 3,463 MW. Approximately 25% of the MWs listed in Table 4 as "being permitted" are located in Utah and Wyoming, therefore it is reasonable to estimate that 900 MWs (conservative emission estimate of 2,600 tons SO_2) of future coal-fired EGUs be attributed to the §309 States.

3. Non-EGUs

The Methodology for projecting emissions from "Other Industrial Sources" is described in E.H. Pechan's October 2006 Report, *2018 SO_2 Emissions Evaluation for Non-Utility Sources- Final*. The report is posted online at http://www.wrapair.org/forums/ssjf/documents/eictts/projections.html.

a) The SO_2 emissions for 19 Natural Gas Processing Plants were updated by Environ in April 2007, with additional research into future O&G Operations. The September 2007 Final Report with results of that update is posted at http://www.wrapair.org/forums/ssjf/documents/eictts/oilgas.html.
b) The 2005 SO_2 Milestone Report had some sources which were not picked up in the Pechan Report. In those cases, the 2005 emissions were used as a placeholder for the 2018 emission values.
c) The projections do not specifically break out emissions from existing sources vs. new sources. For purposes of establishing a new source set-aside, 2006 emissions were assumed to be the baseline emissions for existing sources, and the projected increase in emissions between 2006 and 2018 is attributed to new source growth.

There have been steady SO_2 emission reductions from the non-utility sector since 1990. Several major sources were shut down, including two copper smelters (BHP San Manuel and Phelps Dodge Chino: 69,491 tons SO_2 in 1990) and a steel mill (Geneva Steel: 8,473 tons SO_2 in 1990). Kennecott Utah Copper reduced SO_2 emissions by 25,000 tons SO_2 during the mid-1990s. During this same time period, oil and gas production increased substantially in all three states requiring upgrades to processing plants and other facilities to address potential air quality problems. These upgrades have largely been completed, and it is anticipated that future emissions will reflect growing demand for natural gas in the Western US. As can be seen in Figure 1, emissions have leveled off in recent years and are likely to increase as the US emerges from a major recession in coming years. The 2006 EH Pechan Report describes in detail the methodology that was used to project future emissions for each source category.

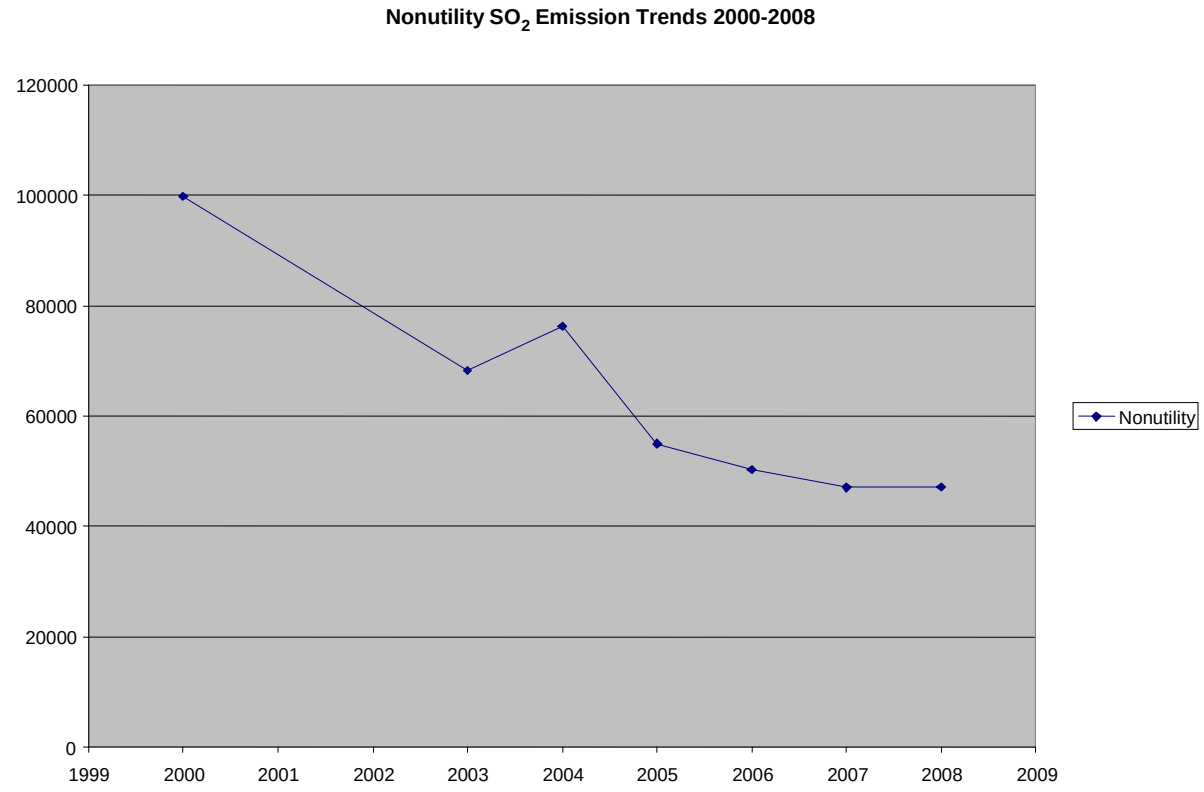


Figure 1. Non-Utility Emission Trends

Table 2 summarizes the projected 2018 baseline SO_2 emissions for the 3-state region.

Table 2. 2018 Baseline

	Projected 2018 SO_2 Emissions Baseline
Utility	128,409
Non-Utility	49,961
New Source Growth Utility	6,600
New Source Growth Non-Utility	5,686
Total 2018 Baseline	190,656

E. Estimated Emission Reductions Due to BART

The SO_2 milestones and Backstop Trading Program were designed primarily to achieve reasonable progress towards meeting the long-term visibility goal. As outlined in the Regional Haze Rule, in cases where an alternative program has been designed to meet requirements other than BART, States are not required to make BART determinations under 40 CFR 51.308(e) and may use simplifying assumptions in establishing a BART benchmark based on an analysis of what BART is likely to be for similar types of sources within a source category. Emission estimates for 2018, assuming the application of BART for SO_2 on all subject-to-BART sources in the three states, were prepared and are compiled in a spreadsheet named "8-11-10_milestone.xls" (see technical support documentation). The 2018 estimates for these sources are estimates of actual emissions and therefore reflect greater emission reductions than would be enforceable in a case-by-case BART permit. The methodology that was used to estimate these emission reductions is described below.

1. Utilities - Presumptive BART.

All utilities that were determined to be subject to BART were assumed to be operating at the presumptive emission rate established in 40 CFR Part 51, Appendix Y (0.15 lb/MMBtu). Actual emissions at this presumptive emission rate were estimated for 2018.

2. Other Sources.

The SO_2 milestones were primarily designed to achieve reasonable progress for all sources of SO_2 in the 3-state region and therefore the Regional Haze Rule allows States to use simplifying assumptions in establishing the BART benchmark. EPA has not established presumptive emission rates for non-utilities, therefore another approach was needed to estimate emission reductions from four boilers located at two trona facilities in SW Wyoming. Recent pollution control projects achieved a 63% reduction in SO_2 from two of the boilers, and represent reasonably stringent controls, considering the age and purpose of the facility. Therefore, the emission rate achieved by these projects is used as the BART benchmark for the four boilers.

I. General Chemical Soda Ash Partners, Green River Plant

C Boiler
Constructed in 1/74
Fuel Analysis for coal: 262,800 tons/year; 534 x 10e6 BTU/hr site rated capacity
Emission limit for SO_2 1.2 lb/MMBtu; 640.8 lb/hr; 2806.7 TPY

D Boiler
Constructed in 1/75
Fuel Analysis for coal: 388,000 tons/year; 880 x 10e6BTU/hr site rated capacity
Emission limit for SO_2 1.2 lb/MMBtu; 1056.0 lb/hr; 4625.3 TPY

II. FMC Wyoming Corporation Westvaco Facility

NS-1A
Constructed in 1975
Modified 8/2007 (New chevron mist eliminators installed in venturi scrubber)
Fuel Analysis coal: 380,888 tons/year; 887 x 10e6 BTU/hr site rated capacity
Emission limit for SO_2 0.54 lb/MMBtu;

NS-1B
Constructed in 1975
Modified 7/2008 (New chevron mist eliminators installed in venturi scrubber)
Fuel Analysis coal: 380,888 tons/year; 887 x 10e6 BTU/hr site rated capacity
Emission limit for SO_2 0.54 lb/MMBtu

All four boilers were originally constructed in SW Wyoming for purposes of processing trona in the mid 1970's. As process units, these four boilers are subject to greater load swings than would be experienced at electric generating units which typically come up to full operating levels and stay there. All four boilers were at one time operating under emission limits of 1.2 lb/MMBtu. All four boilers are roughly the same size with site rated capacities between 880 MMBtu/hr and 887 MMBtu/hr except for the oldest boiler, C Boiler at General Chemical at Green River rated at 534 MMBtu/hr. All four boilers burn primarily coal with oil and gas used as start up fuels. All four units have been participating in the SO_2 Backstop Trading Program, reporting inventories annually as required by Wyoming Air Quality Standards and Regulations.

Two of the four units, NS-1A and NS-1B operated by FMC, sought early SO_2 reductions in 2007 and 2008, respectively, as participants in the §309 program. These two units reduced SO_2 emissions by 55 percent or 5,126 tons collectively, from both units. New chevron mist eliminators were installed on venturi scrubbers to accomplish this reduction. Since that time, FMC has reviewed additional reductions resulting in a total reduction from the 2018 baseline of 5,827 tons or an additional 701 tons. Total reduction from the 1.2 lb/MMBtu emission rate is a 63 percent removal rate. The State of Wyoming has reviewed these additional reductions and has determined that they represent reasonably stringent controls, considering the age and purpose of the facility.

In a similar fashion, the State has reviewed potential SO_2 reductions at the General Chemical facility at Green River and has concluded that a 63 percent removal rate is also appropriate for the two boilers located at that facility. As was mentioned above, these facilities are similar in age and purpose. General Chemical boilers C and D are currently permitted at 7,432 tons of SO_2 operating at 1.2 lb/MMBtu. The State would expect that reasonably stringent controls at this facility would result in a similar 63 percent reduction from the same starting point of 1.2 lb/MMBtu. Reviewing reductions from the 2018 milestone baseline, the General Chemical boilers would be looking at reducing emissions by 2,669 tons.

While the 2018 milestone baseline level is not the same for the two companies, the State has determined that equitable treatment of like facilities would require similar reductions from the two companies prior to the §309 program. Both companies would be reducing emissions from a starting point of 1.2 lb/MMBtu down to 0.45 lb/MMBtu. In the case of FMC, who made early

reductions in the program, an additional 701-ton reduction is expected to be achieved. In the case of General Chemical, 2,669 tons will be achieved. The total reduction from both facilities has been estimated at 3,370 tons. The State has determined that these are reasonably stringent controls and the resulting emissions would serve as an adequate BART benchmark.

3. Summary.

The estimated emission reductions due to the application of BART in the §309 States are summarized in Table 3.

Table 3. Emission Reduction Due to BART

	2018 Baseline SO_2	2018 SO_2 With BART	Emission Reduction Due to BART
Utilities	128,409	82,972	45,437
Non-Utilities	49,961	46,661	3,370
Total			48,807

F. 2018 BART Benchmark

2018 Baseline	190,656
Estimated BART Reductions	-48,807
Total	141,849

G. Milestones Provide Greater Reasonable Progress Than BART

The Regional SO_2 milestone of **141,849** equals the BART benchmark, but provides greater reasonable progress than BART for the reasons outlined below.

1. Early Reductions.

The GCVTC recommended that the market trading program "contain specific provisions to encourage and reward early emission reductions, including reductions achieved before 2000."[2] The GCVTC committed to achieve a 13% reduction in SO_2 emissions from stationary sources by the year 2000. The GCVTC also recognized that there was a good possibility that actual emission reductions would be greater than this 13% goal. A general plan was derived to give some early reductions credit to the region and some to the environment. The emission reductions

[2] *Recommendations for Improving Western Vistas* at 33 (June 1996).

that were greater than 13% were to be split, with ½ going to the environment (through the establishment of milestones) and the other ½ providing headroom.[3]

Sulfur dioxide emissions decreased by 25% in the 9-state GCVTC region between 1990 and 2000, and SO_2 emissions in the three §309 states 33% in that same time period.

The regional milestones have been in effect since 2003 when the original five participating states submitted regional haze SIPs, as required by Section 309 of the Regional Haze Rule. The 2003 SIP was designed to provide flexibility so that sources could find the most cost-effective way to reduce SO_2 emissions, including over-controlling some plants while opting for lower cost controls at other plants. The 2003 SIP was also designed to encourage early reductions by providing an extra allocation for sources that made reductions prior to the program trigger year. The 2003 SIP influenced the long-term planning for sources in the region, and utilities began upgrading plants based on the provisions of the SIP years earlier than would have been required under a case-by-case BART determination in a §308 SIP.

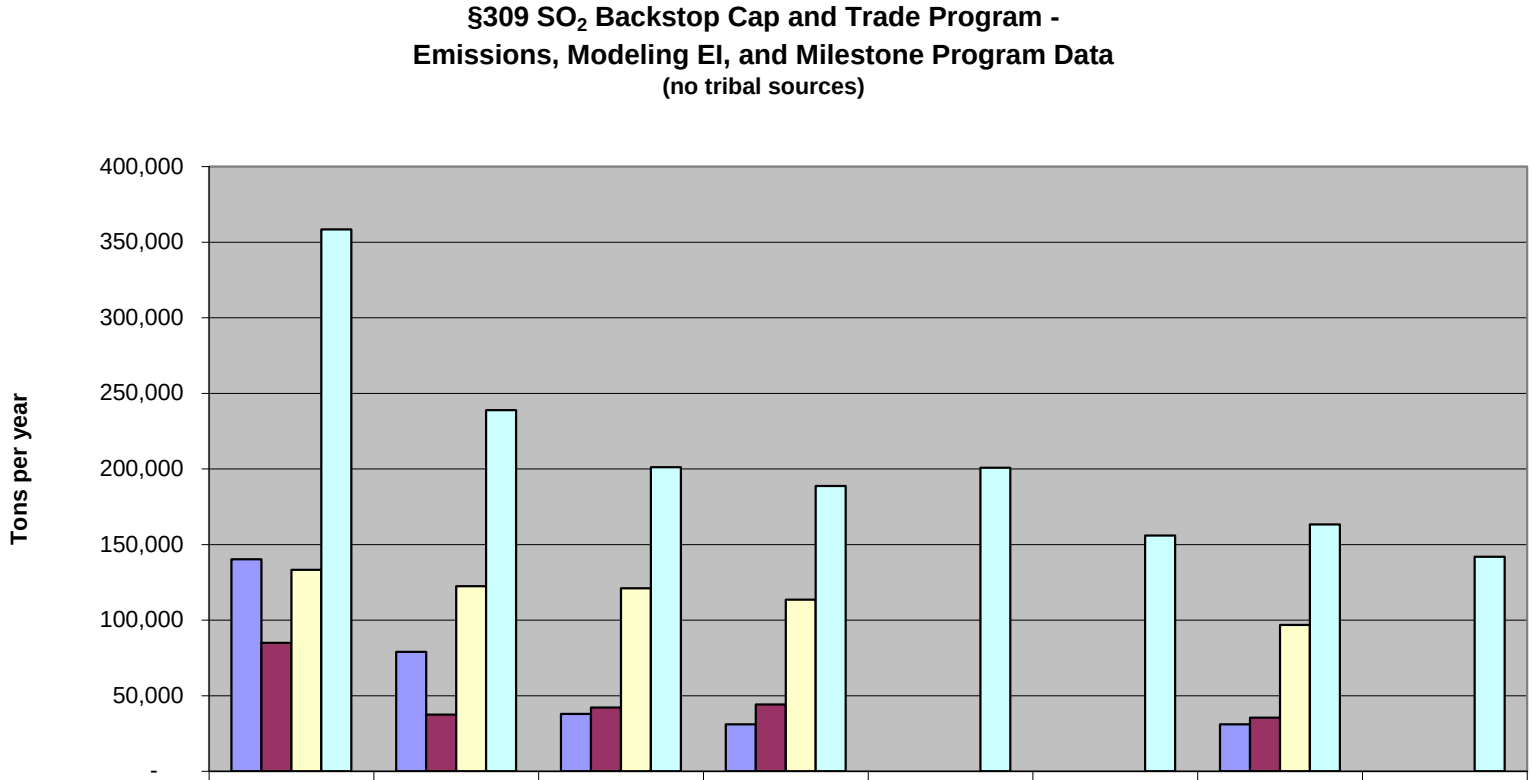
Emissions in the 3-state region decreased an additional 31% between 2000 and 2008.[4] Figure 2 shows the emission reductions from 1990 baseline emissions in the §309 states that will have been achieved by 2018. This total 60% reduction from 1990 emissions is well on the way to the GCVTC goal of reducing SO_2 emissions by 50% - 70% by the year 2040.

Figure 3 shows the sulfate contribution to visibility at the long-term IMPROVE sites located on the Colorado Plateau. As can be seen from these graphs, there has been a steady decrease in the visibility impact due to sulfates. The trend is especially apparent on the 20% best days that are not affected by the variability of fire emissions in the region.

[3] *Id.* at 34.

[4] *WRAP 2008 Regional Emissions and Milestone Report*, March 31, 2010.

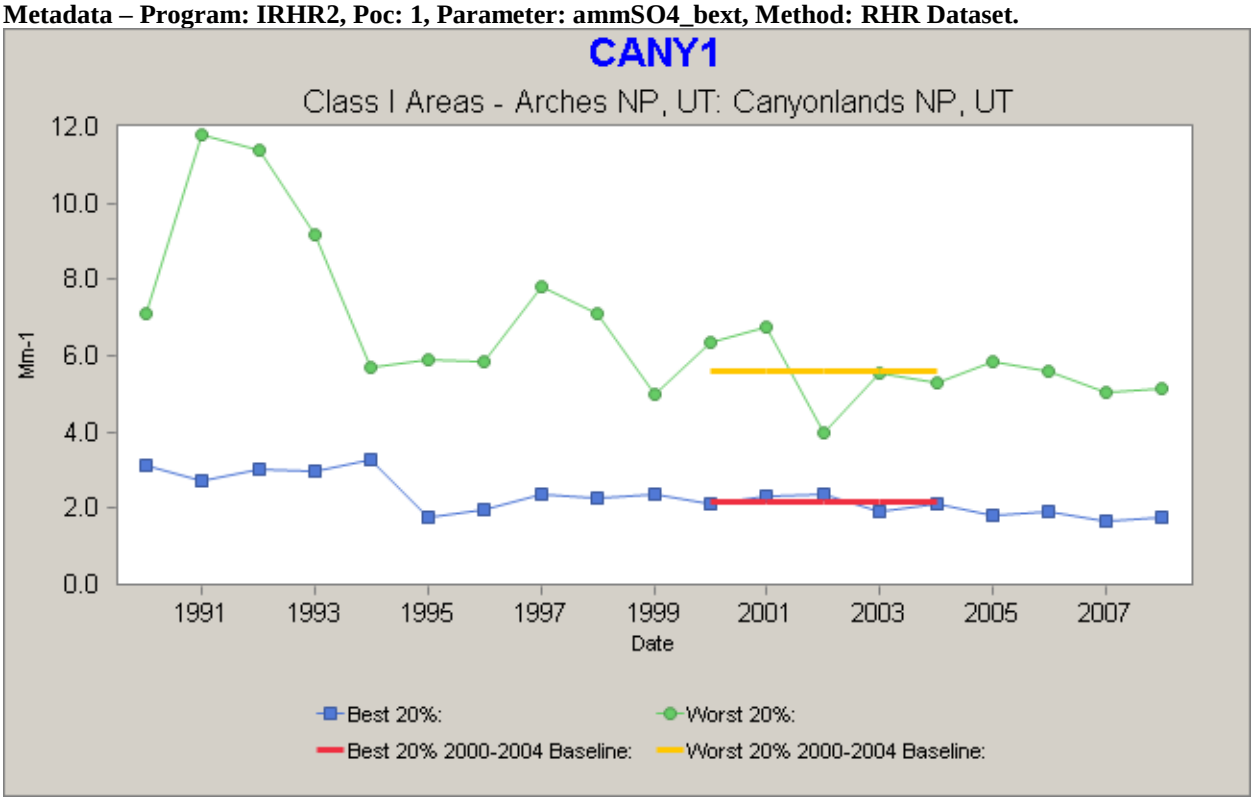
Figure 2. Emission Trends



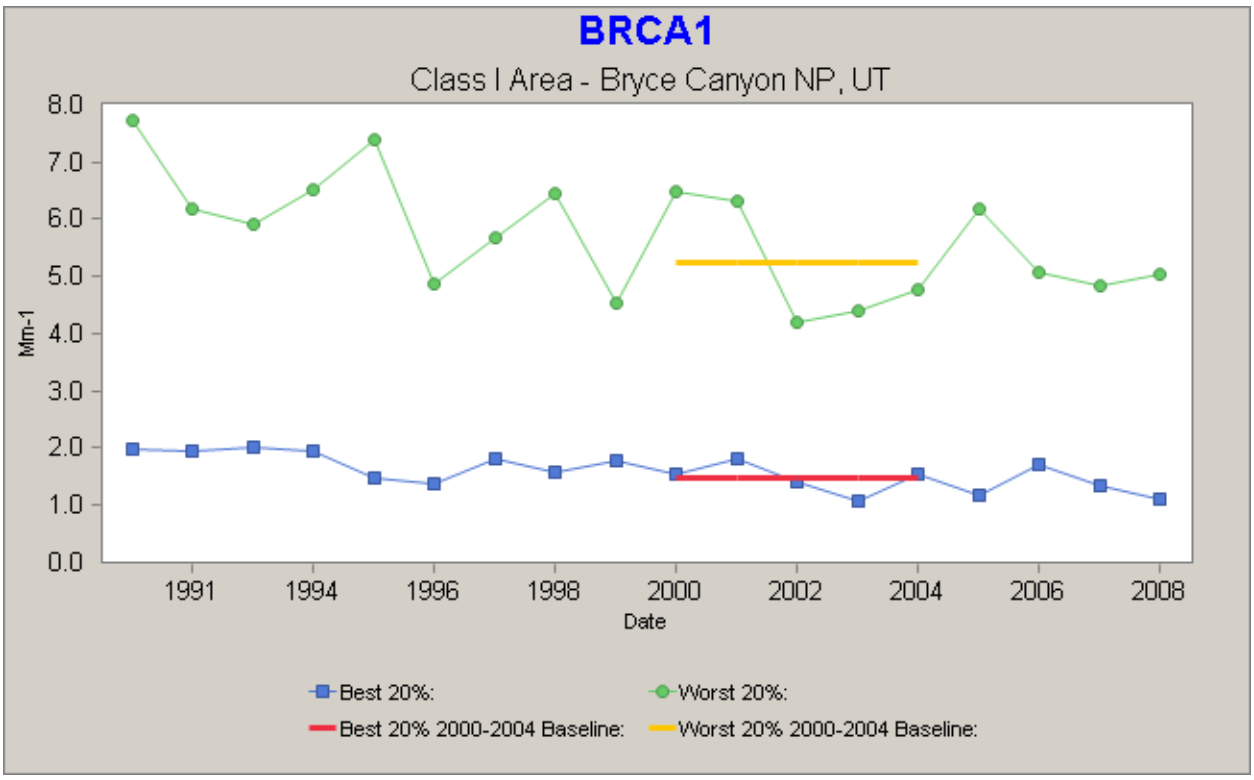
	1990	2000	2002 (Plan02d)	2006 Milestone Report	2008 Milestone	2013 Milestone	2018 (PRP18b)	2018 Milestone
NM	140,177	79,011	37,918	31,068			31,012	
UT	84,983	37,483	42,183	44,175			35,429	
WY	133,204	122,373	120,991	113,465			96,809	
3-State Total	358,364	238,867	201,092	188,708	200,722	155,940	163,250	141,849

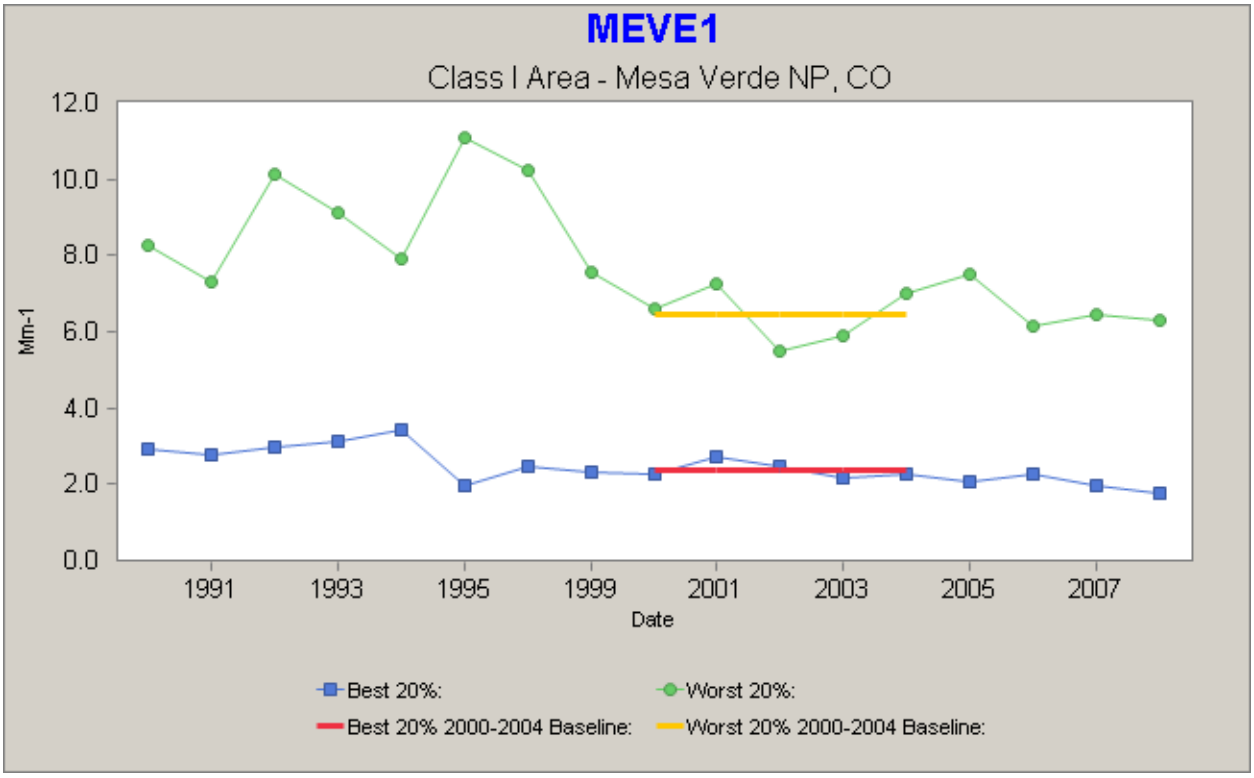
Figure 3. Sulfate Contribution to Light Extinction at Class I Areas on the Colorado Plateau.[5]

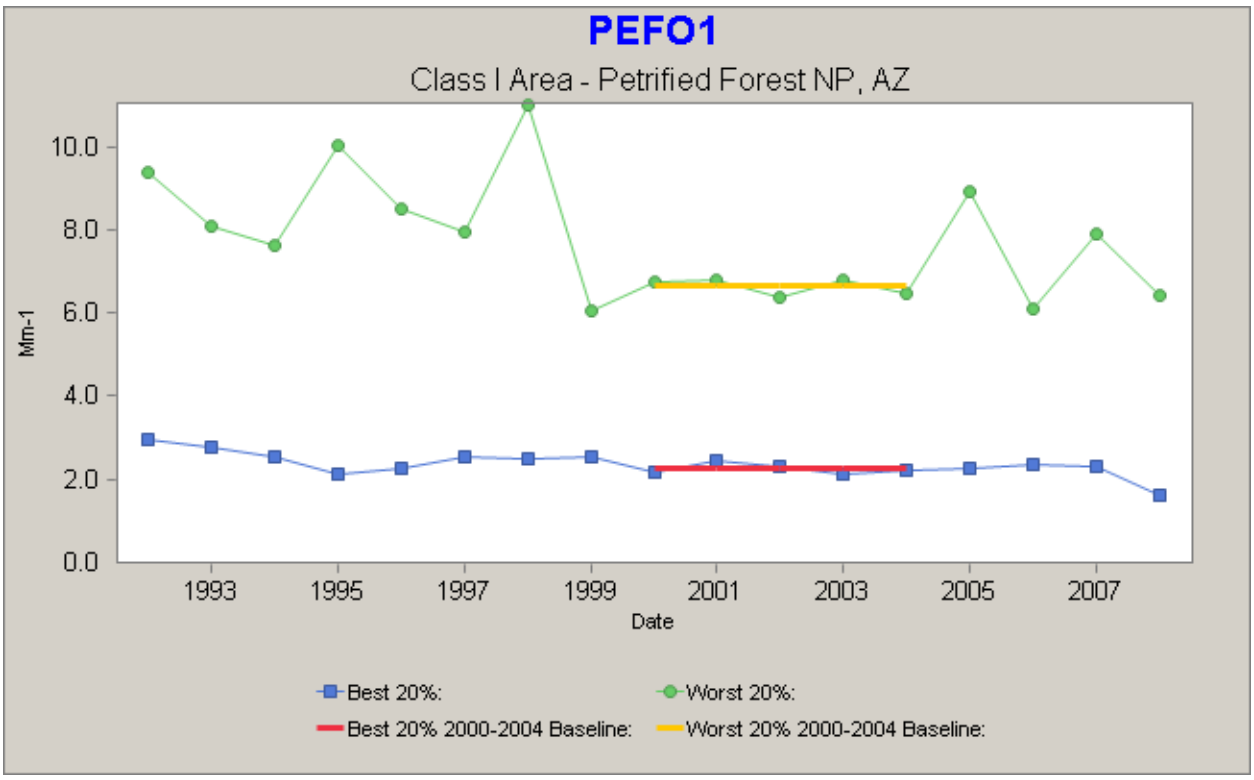
Series – Aggregation: Best 20%, Worst 20%, Best 20% 2000-2004 Baseline, Worst 20% 2000-2004 Baseline, Metadata – Program: IRHR2, Poc: 1, Parameter: ammSO4_bext, Method: RHR Dataset.

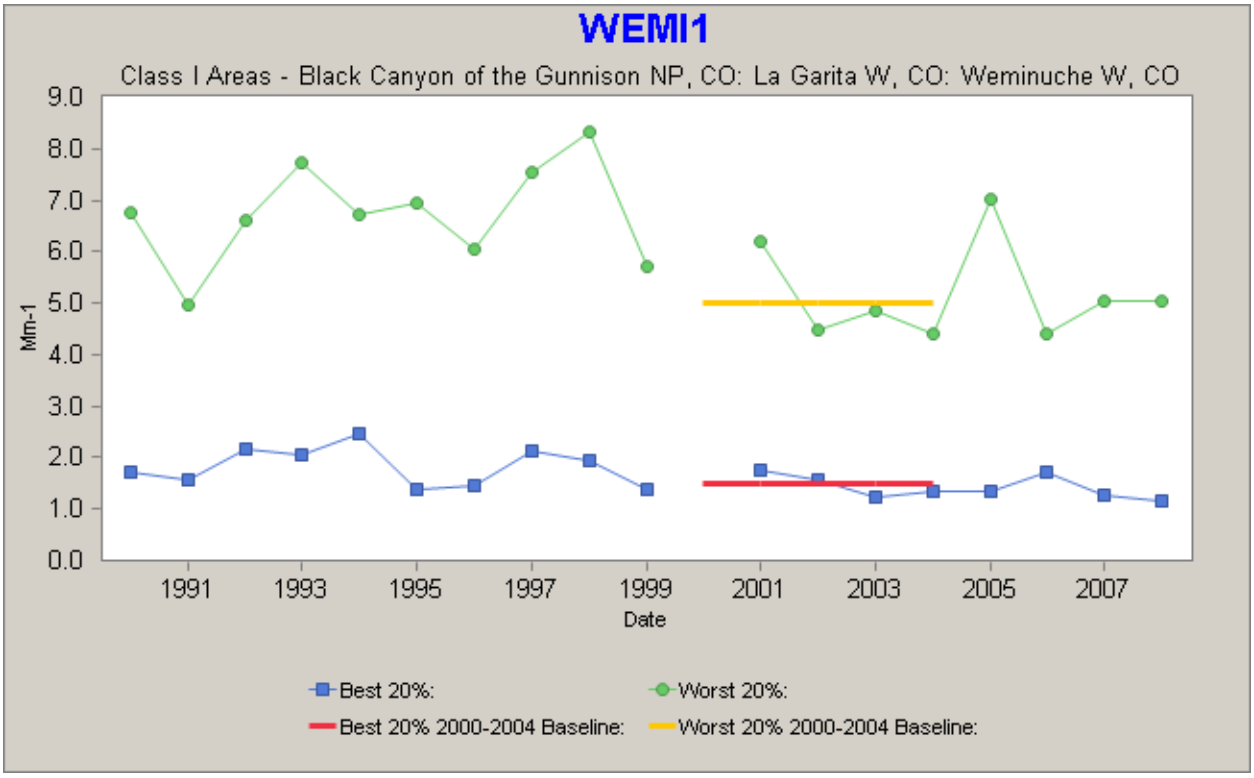


[5] Only those Class I areas on the Colorado Plateau with at least 15 years of data are included in this figure.


BRCA1
Class I Area - Bryce Canyon NP, UT
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Mm-1
1991
1994
1996
1998
2000
2002
2004
2006
2008
Date
Best 20%:
Worst 20%:
Best 20% 2000-2004 Baseline:
Worst 20% 2000-2004 Baseline:


MEVE1
Class I Area - Mesa Verde NP, CO
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Mm-1
1991
1993
1995
1999
2001
2003
2005
2007
Date
Best 20%:
Worst 20%:
Best 20% 2000-2004 Baseline:
Worst 20% 2000-2004 Baseline:


PEFO1
Class I Area - Petrified Forest NP, AZ
Mm-1
10.0
8.0
6.0
4.0
2.0
0.0
1993
1995
1997
1999
2001
2003
2005
2007
Date
Best 20%:
Worst 20%:
Best 20% 2000-2004 Baseline:
Worst 20% 2000-2004 Baseline:


WEMI1
Class I Areas - Black Canyon of the Gunnison NP, CO: La Garita W, CO: Weminuche W, CO
Mm-1
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1991
1993
1995
1997
1999
2001
2003
2005
2007
Date
Best 20%:
Worst 20%:
Best 20% 2000-2004 Baseline:
Worst 20% 2000-2004 Baseline:

2. Additional Sources Included.

The Backstop Trading Program includes all stationary sources with emissions greater than 100 tons/year of SO_2. The §309 States designed this program as part of an overall strategy to address all sources of visibility impairing pollutants, rather than focusing on a subset of stationary sources.

	Number of Sources	2006 Emissions	Percentage
Subject to BART	10	121,542	62%
Other Stationary Sources	63	73,038	38%

The inclusion of all major SO_2 sources in the program is necessary to create a viable trading program, and also serves a broader purpose to ensure that growth in emissions from sources that are not subject to BART does not undermine the progress that has been achieved. BART applied on a case-by-case basis would not affect these sources, and there would be no limitation on their future operations under their existing permit conditions. Because the milestones will cap these sources at actual emissions (which are less than current allowable emissions), the overall effect of their inclusion is to provide greater reasonable progress than would have been achieved if only sources that are subject to BART were included in the program.

3. Cap on New Source Growth.

When Congress established the visibility program in 1977 it declared as a national goal "the prevention of any future, and the remedying of any existing" anthropogenic visibility impairment in mandatory Class I federal areas.[6] BART is an emission limitation established at a specific source and is designed as a remedy to impairment at specific mandatory Class I areas. By contrast, the SO_2 milestones developed by the §309 States serve the dual purpose of remedying existing impairment and preventing future impairment by requiring regional SO_2 emissions reductions and capping emissions for stationary sources. Future impairment is prevented by capping emissions growth from sources not eligible under the BART requirements, from sources subject to BART that are expected to significantly increase utilization, and from entirely new sources in the region.

The milestones include estimates for growth, but then lock these estimates in as an enforceable emission cap. The milestone approach is consistent with the statutory goal of preventing any future visibility impairment that results from man-made air pollution. The entire region is experiencing rapid growth which could erode the progress that has been achieved in the last two decades towards improving visibility. BART applied on a case-by-case basis would have no impact on future growth, and in the long run would not achieve the regional emission reductions that are guaranteed by the program.

[6] CAA § 169A(a)(1).

4. Commission Strategies are a Total Package.

The GCVTC recommendations were developed as a comprehensive strategy includes strategies to address mobile sources, prescribed fire, pollution prevention, and Clean Air Corridors. The stationary source strategies need to be viewed as part of this overall package. Visibility impairment in the west is caused by multiple sources and pollutants, and a narrow focus on stationary sources may not achieve the same results as a broad-based program. When viewed as part of the entire SIP, the milestones achieve much greater reasonable progress than BART.

5. Mass Based Cap has Inherent Advantages Over BART

The baseline emission projections and assumed reductions due to the assumption of BART-level emission rates on all sources subject to BART are all based on actual emissions, using 2006 as the baseline. The use of actual emissions has an effect in several ways. If the BART process was applied on a case-by-case basis to individual sources, emission limitations would typically be established as an emission rate (lbs/hr or lbs/MMBtu) that would account for variations in the sulfur content of fuel and alternative operating scenarios. The difference between actual emissions and allowable emissions is particularly large when a source is permitted to burn two different fuel types, such as oil and natural gas, or when the source is part of a cyclical industry where production varies from year to year due to the changing demand for their product. A mass-based cap that is based on actual emissions is more stringent because it does not allow a source to consistently use this difference between current actual and allowable emissions.

Another difference is that mass-based limits will include excess emissions that may occur due to malfunctions or during the start-up or shut-down of emission units. A good example of this difference is the requirement in the acid rain program that emissions must be assumed to be the highest value recorded from the past year during the time period that continuous emission monitors are not functioning on a stack. These higher emissions are calculated as part of the overall tons/year, and must be accounted for under the mass-based cap for the acid rain program.

6. Tribal Set-Aside

The GCVTC recommended a market based program to address stationary source emissions of SO_2. The GCVTC recommended that the market based program include allocations to tribes that are of practical benefit.[7] This recognized the concern that "tribes, by and large, have not contributed to the visibility problem in the region" and that "[t]ribal economies are much less developed than those of states, and tribes must have the opportunity to progress to reach some degree of parity with states in this regard."[8] The tribes specifically recommended that if an emission trading strategy is adopted to achieve SO_2 reductions from stationary sources that allocations be based on considerations of equity rather than historical emissions:

[7] *Recommendations for Improving Western Vistas* (June 1996). at 35.

[8] *Id.* at 66-67.

> Credits should not be based on historical emissions, but should be based on equitable factors, including the need to preserve opportunities for economic development on tribal lands. In general, these lands are currently lacking in economic bases and have not contributed to the visibility problems.[9]

Accordingly, the Backstop Trading Program contains a 2,500 allocation to tribes in the GCVTC region. Case-by-case BART permits would not provide this practical benefit to tribes that was an integral part of the GCVTC recommendations.

7. Other Class I Areas Also Show Improvement in Visibility

In addition to demonstrating successful SO_2 emission reductions, §309 states have also relied on visibility modeling conducted by the WRAP to demonstrate improvement at Class I areas. The complete modeling demonstration showing deciview values was included as part of the visibility improvement section in each of the State §309 SIPs, but the SO_2 portion of the demonstration has been included below as Table 4 to underscore the improvements associated with §309 SO_2 reductions and further demonstrate why the §309 program is better than BART. 40 CFR 51.309(g)(2)(i) allows states to build upon the strategies implemented in a §309 program and take full credit for visibility improvement achieved through these strategies when addressing additional Class I areas. This table demonstrates achievements in visibility in these additional Class I areas (off the Colorado Plateau) in and surrounding the three states participating in the §309 program. For the most part, the table shows projected visibility improvement for 2018 with respect to SO_2 on the worst days and no degradation on the best days. There is one Class I area in New Mexico off the Colorado Plateau that is not showing improvement on the worst days. The State of New Mexico has reviewed the emissions data related to impacts in the Gila Wilderness and has determined that the visibility degradation is largely due to increasing point source emissions from Mexico.

[9] *Id.* at 71.

Table 4. Visibility - Sulfate Extinction Only

Class I Area Monitor (Class I Areas Represented)	20% Worst Visibility Days (Monthly Average, Mm^{-1})		20% Best Visibility Days (Monthly Average, Mm^{-1})	
	2018 [1] Base Case (Base 18b)	2018 [2] Preliminary Reasonable Progress Case (PRP18a)	2018 [1] Base Case (Base 18b)	2018 [2] Preliminary Reasonable Progress Case (PRP18a)
Bridger, WY (Bridger WA and Fitzpatrick WA)	5.2	4.3	1.6	1.3
North Absaroka, WY (North Absaroka WA and Washakie WA)	4.8	4.5	1.1	1.1
Yellowstone, WY (Yellowstone NP, Grand Teton NP and Teton WA)	4.3	3.9	1.6	1.4
Badlands, SD	17.8	16.0	3.5	3.1
Wind Cave, SD	13.0	12.1	2.7	2.5
Great Sand Dunes NM, CO	5.3	4.9	2.0	1.8
Mount Zirkel, CO (Mt. Zirkel WA and Rawah WA)	4.6	4.1	1.4	1.3
Rocky Mountain, CO	6.8	6.2	1.3	1.1
Gates of the Mountains, MT	5.3	5.1	1.0	1.0
UL Bend, MT	9.7	9.6	1.8	1.7
Craters of the Moon, ID	5.8	5.5	1.5	1.5
Sawtooth, ID	3.0	2.8	1.2	1.1
Bandelier NM, NM	6.4	5.9	2.4	2.2
Bosque del Apache NWRW, NM	7.0	6.6	2.7	2.5
Gila W, NM	6.2	6.7	1.8	1.8
Salt Creek NWRW, NM	14.4	14.0	3.3	3.1
Wheeler Peak, NM (Pecos W and Wheeler Peak W)	4.7	4.4	1.1	1.0
White Mountain W, NM	8.9	8.7	1.8	1.7
Great Basin NP, NV	4.1	4.1	1.2	1.2
Jarbidge W, NV	3.8	3.4	1.3	1.2
Chiricahua, AZ (Chiricahua NM, Chiricahua W, Galiuro W)	7.4	7.4	2.2	2.1
Ike's Backbone, AZ (Mazatzal W, Pine Mountain W)	6.1	5.9	2.2	2.1
Queen Valley, AZ	7.5	7.5	3.0	3.0
Saguaro NM, AZ	7.1	6.8	2.6	2.5
Saguaro West, AZ	7.3	7.1	3.2	3.1
Sierra Ancha, AZ	6.0	5.8	2.2	2.1
Superstition, AZ	6.7	6.5	2.7	2.6
Guadalupe Mountains NP, TX (Carlsbad Caverns NP, NM and Guadalupe Mountains NP, TX)	13.7	13.6	3.3	3.2

[1] Represents 2018 Base Case growth plus all established controls as of Dec. 2004. No BART or SO_2 Milestone assumptions were included.
[2] Represents 2018 Preliminary Reasonable Progress growth estimates and established SO_2 limits.

H. Comparison of Trading vs. Command and Control BART Requirements

During the development of the Annex, the WRAP conducted modeling to determine whether the distribution of emissions under the Backstop Trading Program would differ substantially from the distribution of emissions assuming installation of BART or would disproportionately impact any Class I area due to a geographic concentration of emissions. The results of this modeling are included in Tables 2 and 3 of Attachment C to the Annex[10.] Attachment C, Section G concludes, "The results of this analysis showed that the maximum difference between the two scenarios at any of the Class I areas was only 0.1 deciviews.[11]"

10 *Voluntary Emissions Reduction Program for Major Industrial Sources of Sulfur Dioxide in Nine Western States and A Backstop Market Trading Program, an Annex to the Report of the Grand Canyon Visibility Transport Commission* (September 2000) at C-15 and 16.

11 *Id*. at C-21.