United States Department of the Interior
NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
Denver, Colorado 80225

IN REPLY REFER TO:

N3615 (2350)

September 17, 2012

Thomas Webb
U. S. Environmental Protection Agency Region 9
Planning Office, Air Division Air-2
75 Hawthorne Street
San Francisco, California 94105

Docket ID No. EPA–R09-OAR-2012-0021

Dear Mr. Webb:

The National Park Service (NPS) has reviewed the Environmental Protection Agency's (EPA's) proposed "Approval, Disapproval and Promulgation of Air Quality Implementation Plans; Arizona; Regional Haze State and Federal Implementation Plans" published in the Federal Register on July 20, 2012.

We commend EPA for a thorough analysis of Best Available Retrofit Technology (BART) for the Apache, Cholla, and Coronado power plants in Arizona. We agree with EPA that consistency is important in applying the regional haze rule requirements across the country and that BART decisions for nitrogen oxides (NO_x) emissions controls in other states are relevant to Arizona. We also agree with EPA that Arizona Department of Environmental Quality overestimated the costs of NO_x controls by including costs that were not consistent with the EPA Control Cost Manual and underestimated the visibility benefits of controls by considering impacts at only the Class I area with maximum impact rather than cumulative impacts at all Class I areas. Since these facilities impact nine to seventeen Class I areas, it is important to consider cumulative benefits in the BART decision. We commend EPA's analyses of costs and benefits and agree with EPA's conclusions based on the data available at the time of proposal. Our comments are further detailed in the enclosures.

We appreciate the opportunity to work closely with Arizona and EPA to make progress toward achieving natural visibility conditions at our National Parks and Wilderness Areas. For further information regarding our comments, please contact Don Shepherd at (303) 969-2075.

Sincerely,

Susan Johnson
Chief, Policy, Planning, and Permit Review Branch

enclosures

cc:

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National Park Service Comments on Best Available Retrofit Technology for Apache, Cholla, and Coronado Power Plants in Arizona
September 17, 2012

General Comments

We agree with EPA R9 that Arizona Department of Environmental Quality (ADEQ) did not appropriately calculate the costs of controls, did not consider the cumulative visibility benefits of controls, and did not provide a sufficient explanation and rationale for its determinations of Best Available Retrofit Technology for the Apache, Cholla, and Coronado power plants. We commend EPA R9 for its independent evaluation of the costs and benefits of various NO_X control options. We also commend EPA R9 for requesting comment on whether requiring higher SO_2 control efficiency is appropriate at Apache and Cholla power plants.

Costs of Control

We agree with EPA R9 that the costs of control were not calculated by ADEQ in accordance with the BART Guidelines and that costs were included for items not allowed by the EPA Control Cost Manual (e.g., owner's costs, surcharge, escalation, and Allowance for Funds Utilized During Construction—AFUDC). As EPA R9 noted, this inflates the total cost of compliance and the cost per ton of pollutant reduced. Our review of industry data (Please see Appendix A. SCR Costs.) indicates that the total capital investment (TCI) for SCR retrofits is typically about $200/kW. The TCI estimates for Apache and Cholla equaled or exceeded $250/kW.

The BART Guidelines recommend use of the Control Cost Manual (CCM) if vendor data is not available. As described in Appendix A, in conducting our cost analyses of SCR, we used an approach similar to that used by EPA R8 in its evaluation of SCR on the Colstrip power plant where we sought to align our cost methodologies with the CCM and also relied on EPA's Integrated Planning Model to ensure that our methods reflect the most recent cost levels seen in the marketplace. In conducting our analyses, we observed that most of the ADEQ SCR cost estimates were based upon TCI costs that were relatively high ratios of the reported direct capital costs (DCC). According to the CCM, the ratio of TCI to DCC is 141%:

- At Apache, TCI = 179% of DCC for both units and included $6 million in costs for each unit not typically allowed by EPA.
- At Cholla, TCI = 258% of DCC for all three units and included $11 million in costs for units #2 and #3 (each) and $15 million for unit #4 that are not typically allowed by EPA.
- At Coronado, data were not sufficient to calculate these values.

This supports EPA R9's concern that control costs submitted by the utilities either included costs not typically allowed by EPA or were inadequately documented.

Visibility benefits

We agree with EPA R9 that ADEQ appears to have considered the visibility benefit of controls at only a single Class I area for each facility, even though there are nine to seventeen Class I areas nearby, depending on the facility. Since the facilities' modeling results indicated that controls would contribute to visibility improvement in multiple Class I areas, consideration of the benefits in additional areas is warranted. Overlooking significant visibility benefits at

additional areas considerably understates the overall benefit of controls to improve visibility. The procedure followed by ADEQ is not a sufficient basis for making BART determinations for sources with substantial benefits across many Class I areas.

We agree with EPA R9 that a more complete assessment of the degree of visibility improvement for candidate BART controls would include consideration of the number of areas affected and the degree of visibility improvement expected in all areas. As EPA R9 (and NPS previously) suggested, one could conduct this type of analysis by summing the benefits over the areas.

We agree with EPA R9 that the ammonia background concentration assumed for Cholla and Coronado may be too low, ranging from 1 ppb to as low as 0.2 ppb. In the absence of compelling ammonia background estimates, EPA guidance recommends the use of a 1 ppb ammonia background for areas in the west.

We commend EPA R9 for the thoroughness of its visibility modeling analyses and the methodologies used. For example, EPA R9 used CALPUFF methods 6 and 8 and modeled against annual average and 20% best natural background conditions. EPA R9 also modeled all pollutants while varying NO_X emissions to evaluate the effects of changing this one pollutant.

We commend EPA R9 for its reliance on deciview (dv) improvement and the number of areas showing improvement, plus its consideration of cumulative improvement which provides a supplemental measure that combines information on the number of areas and on individual area improvement.

SCR Control Efficiency

We agree with EPA R9's reliance upon an SCR level of performance of 0.05 lb/mmBtu, which is consistent with determination made by EPA R6 for the San Juan Generating Station in NM, and with EPA R8's assumptions for SCR at the Colstrip and Corette power plants in MT.

SO_2 Control Efficiency

In response to EPA's request for comment on SO_2 control efficiency at Apache and Cholla power plants we note that:

- Minnesota is requiring that Xcel Energy upgrade the existing scrubbers at it King and Sherburne County plants to meet 0.12 lb/mmBtu.
- According to the Colorado Department of Public Health & Environment, "Colorado Ute Electric Association, which owned Craig before TriState, installed wet limestone FGD systems on Craig Units 1 and 2 when the units began operations in 1980 and 1979, respectively. TriState upgraded these FGD systems in the 2003 – 2004 timeframe. The current Operating Permit also requires that 100% of the flue gas in the FGD be treated and that the Craig Unit 1 and 2 FGDs be designed to meet at least a 97.3% removal rate."
- In the late 1990s, Public Service of New Mexico (PSNM) replaced its existing SO_2 controls with new limestone forced-oxidation scrubbers. In 2005 PSNM agreed to upgrade the scrubbers by 2009 such that the annual rolling average SO2 percentage reduction for San Juan Units 1, 2, 3, and 4 shall not be less than 90% for each unit (based upon measurements upstream and downstream of scrubbers).

- EPA R8 has recently determined that SO_2 BART for Colstrip units #1 & #2[1] is lime injection with an additional scrubber vessel with an emission limit of 0.08 lb/mmBtu (30-day rolling average) versus the current 0.4 lb/mmBtu annual average emission rate for these two EGUs currently equipped with wet scrubbers.
- The consent decree between EPA and Salt River Project requires installation of WFGD systems on both units at Coronado to achieve a 30-day rolling average SO_2 removal efficiency of at least 95.0 percent or a 30-day rolling average SO_2 emissions rate of no greater than 0.080 lb/mmBtu.

Arizona Electric Power Cooperative (AEPCO) Apache Generating Station

Apache consists of seven EGUs with a total plant-wide generating capacity of 560 MW. According to EPA's Clean Air Markets Database (CAMD), in 2011, out of 1,237 facilities, Apache ranked #242 for SO_2 (3,912 tons) and #142 for NO_X (4,639 tons). EPA modeling estimated that Apache has a 3.41 dv impact at Chiricahua National Monument and 13.67 dv across nine Class I areas within 300 km.

Apache Unit 1

Unit 1 is a wall-fired boiler with a net unit output of 85 MW that burns pipeline-quality natural gas as its primary fuel, but also has the capability to use No. 2 through No. 6 fuel oils. At present, no emissions control equipment is installed on Unit 1. 2011 CAMD emissions were zero tons of SO_2 and one ton of NO_X. We agree with ADEQ's and EPA R9's proposals that BART:

- for NO_X is LNB with FGR (natural gas usage only) with an emission limit of 0.056 lb/mmBtu
- for PM_{10} at Apache Unit 1 is no additional controls, but also that a fuel restriction to allow only the use of natural gas was appropriate. This corresponds to a PM_{10} BART emission limit of 0.0075 lb/mmBtu
- for SO_2 is no additional controls with a fuel restriction to allow only the use of natural gas. This corresponds to an SO_2 BART emission limit of 0.00064 lb/mmBtu

Apache Units 2 and 3

Apache Units 2 and 3 are both dry-bottom, Riley Stoker turbo (wall)-fired boilers, each with a gross unit output of 204 MW. Both units are BART-eligible and are coal-fired boilers operating on sub-bituminous coal. According to CAMD, in 2011, out of 3,621 units, Apache #2 ranked #592 for SO_2 (1,782 tons) and #312 for NO_X (2,005 tons). Apache #3 ranked #523 for SO_2 (2,130 tons) and #226 for NO_X (2,628 tons). Although there are physical differences between the two units, ADEQ found that the overall differences are minimal and therefore considered both units together in its BART analysis.

BART for NO_X

Selection of Baseline Period: AEPCO's BART analysis used a 2002 to 2007 time period in order to establish its baseline NO_X emissions. EPA R9 used the most recent data reported to CAMD,

[1] Colstrip Units 1 and 2 are already controlled by wet Venturi scrubbers, which are for simultaneous particulate and SO2 control. The Venturi scrubbers utilize the alkalinity of the fly ash to achieve an estimated SO2 removal efficiency of 75%.

which, at the time that EPA began its analysis in 2011, was the three-year period from 2008 to 2010. Based on CAMD documentation, no new control technology beyond the existing OFA system has been installed on either Apache Unit 2 or 3. EPA R9 considers the use of this more recent baseline period to be a realistic depiction of anticipated future emissions.

We generally prefer to use the pre-control emissions, as advised by the BART Guidelines, to estimate baseline emissions for the purpose of calculating average cost-effectiveness of the complete control system (e.g., combustion controls plus SCR). This avoids any biasing of the cost-effectiveness calculations by sources that install combustion controls during the BART evaluation process. However, in this case, no combustion controls have been added and we agree with EPA R9's use of the most recent emissions as representative of future emissions in the absence of BART controls.

Summary of Control Cost Estimates: EPA's calculations indicate that the SCR-based control options have average cost-effectiveness values of $2,275/ton to $2,908/ton, which falls in a range that EPA considers cost-effective. Our analysis arrived at similar estimates of $2,392/ton to $3,144/ton. (Please see Appendix B. Apache SCR Costs.)

Proposed Controls	**LNB+OFA+SCR**	**LNB+OFA+SCR**	
Unit	2	3	Totals
Rating (MW Gross) each	204	204	408
Uncontrolled Emissions (tpy)	2,319	3,002	5,322
Uncontrolled Emissions (lb/mmBtu)	0.38	0.44	
Combustion Controls Cost-benefit Analysis			
Control Efficiency	31%	41%	
Controlled emissions (lb/mmBtu)	0.26	0.26	
Controlled Emissions (tpy)	1,607	1,761	3,368
Emissions Reduction (tpy)	712	1,242	1,954
Capital Cost	$ 4,990,118	$ 4,990,118	$ 9,980,236
Capital Cost ($/kW)	$ 24	$ 24	$ 24
O&M Cost	$ 147,845	$ 147,845	$ 295,690
Annualized Cost	$ 558,566	$ 558,566	$ 1,117,132
Cost-Effectiveness ($/ton)	$ 784	$ 450	$ 572
SCR Cost-benefit Analysis			
Control Efficiency	81%	81%	
Controlled emissions (lb/mmBtu)	0.05	0.05	
Controlled Emissions (tpy)	309	339	648
Emissions Reduction (tpy)	1,298	1,422	2,720
Capital Cost	$ 46,796,371	$ 46,796,371	$ 93,592,741
Capital Cost ($/kW)	$ 229	$ 229	$ 229
O&M Cost	$ 1,345,177	$ 1,396,707	$ 2,741,883
Annualized Cost	$ 5,762,423	$ 5,813,953	$ 11,576,376
Cost-Effectiveness ($/ton)	$ 4,439	$ 4,088	$ 4,256
Combustion Controls + SCR Cost-benefit Analysis			
Control Efficiency	87%	89%	
Controlled Emissions (tpy)	309	339	648
Emissions Reduction (tpy)	2,010	2,664	4,674
Capital Cost	$ 51,786,489	$ 51,786,489	$ 103,572,977
Capital Cost ($/kW)	$ 254	$ 254	$ 254
O&M Cost	$ 1,493,022	$ 1,544,552	$ 3,037,573
Annualized Cost	$ 6,320,989	$ 6,372,519	$ 12,693,508
Cost-Effectiveness ($/ton)	$ 3,144	$ 2,392	$ 2,716
Visibility analyses			
Visibility Impact before BART (dv at Max Class I)			3.46
Visibility Impact after BART (dv at Max Class I)			1.95
Visibility Improvement (dv at Max Class I)			1.59
Cost-Effectiveness ($/98th % dv at Max Class I)			$ 7,983,339
Visibility Impact before BART (dv at Summed Class I)			13.67
Visibility Impact after BART (dv at Summed Class I)			7.16
Visibility Improvement (dv at Summed Class I)			6.51
Cost-Effectiveness ($/98th % dv at Summed Class I)			$ 1,949,848

Visibility Improvement

In its Technical Support Document, EPA R9 reports:

> The area with the greatest dv improvement was the Chiricahua Wilderness Area; the improvement from LNB was 0.5 dv, from SNCR was 1 dv, and from SCR was 1.6 dv. Any of these improvements would contribute to improved visibility, with SCR being the superior option for visibility. The corresponding cumulative improvements are 2.1, 3.8, and 6.5. Both SNCR and SCR give improvements exceeding 0.5 dv at four areas, but for SCR the improvements at those areas also exceed a full 1 dv… The improvements from SCR are substantially greater than for the other candidate controls. The modeled degree of visibility improvement supports SCR as BART for Apache.

While we agree with EPA R9's analysis, we caution against any implication that visibility improvement must exceed 0.5 dv in order to be significant—such an approach would be contrary to the BART Guidelines.

Our results were also similar to EPA R9's estimates for the two "dollars per deciview" measures of cost-effectiveness. For the metric, "$/max dv", we estimated $8.0 million. For "$/cumulative dv", we estimated $1.9 million. We also appreciate EPA R9's consideration of our 2010 comments on Arizona's proposed Regional Haze SIP, when we noted that:

> Compared to the typical control cost analysis in which estimates fall into the range of $2,000 - $10,000 per ton of pollutant removed, spending millions of dollars per deciview (dv) to improve visibility may appear extraordinarily expensive. However, our compilation of BART analyses across the U.S. reveals that the average cost per dv proposed by either a state or a BART source is $14 - $18 million.

Our most recent compilation of BART proposals continues to support that range. For all of the NO_X control options, including SCR, both the $/max dv and the $/cumulative dv are well below this range.

EPA's BART Determination

We agree with EPA R9's conclusion that:

> we consider the most stringent available control option, SCR with LNB and OFA, to be both cost-effective and to result in substantial visibility improvement, and that the energy and non-air quality impacts are not sufficient to warrant eliminating it from consideration. Therefore, the results of our five-factor analysis indicate that NOx BART for Apache Units 2 and 3 is SCR with LNB and OFA.

EPA R9 concluded that:

> based on the available control technologies and the five factors discussed above, EPA is proposing to require Apache Generating Station to meet an emission limit for NO_X on Units 2 and 3 of 0.050 lb/MMBtu. Each of these emission limits is based on a rolling 30- boiler-operating-day average.

On June 29, 2012, AEPCO submitted information to EPA R9 related to the affordability of NO_X controls at Apache. AEPCO states that affordability is affected by its small size, the low income profiles of AEPCO's service area, and AEPCO's ability to access financing. Using publicly available information, EPA R9 estimates that the annualized cost of requiring SCR in Units 1 and 2 would likely be in the range of 3 percent of AEPCO's assets and between 6 and 7 percent of AEPCO's annual sales. The projected costs of SCR with LNB and OFA are approximately $12 million per year. This exceeds AEPCO's net margins of $9.5 million in 2010 and $1.9 million in 2011. We agree that "affordability" is an important issue and is a valid consideration under the BART Guidelines. Our independent analysis of the costs of SCR with LNB and OFA agree with EPA R9's estimate of approximately $12 million per year. We defer to EPA regarding the affordability of SCR at Apache.

BART for PM_{10}

We agree with ADEQ and EPA R9 that BART for PM_{10} is upgrades to the existing ESP and a PM_{10} emissions limit of 0.03 lb/mmBtu. ADEQ also noted that "PM_{10} emissions will be measured by conducting EPA Method 201/202 tests."

EPA R9 expressed concerns that use of SCR at these units is expected to result in increased condensable particulate matter in the form of sulfuric acid mist (H_2SO_4). EPA R9 states that:

> In effect, the emission limit would be more stringent than intended by ADEQ and would likely not be achievable in practice. EPA is requesting comment on whether to allow compliance with the PM10 limit to be demonstrated using test methods that do not capture condensable particulate matter, namely EPA Methods 1 through 4 and Method 5 or Method 5e.

We do not believe that H_2SO_4 emissions will be significant. Our application of the EPRI method for estimating H_2SO_4 emissions results in an additional 0.0027 lb/mmBtu from SCR for each unit. (Our estimate is consistent with the estimates provided in UNC tables A-1 (b) and A-3(b).) Thus, H_2SO_4 from SCR would contribute less than 10% to the PM_{10} limit. (Please see Appendix C. Apache SCR H2SO4.) We suggest that the larger issue may be whether condensable emissions should be included in the PM_{10} limit. In that case, the 0.030 lb/mmBtu limit proposed by ADEQ could be adjusted to 0.033 lb/mmBtu to reflect the increase in Total PM_{10} attributable to SCR, and that "PM_{10} emissions will be measured by conducting EPA Method 201[or Method 201A]/202 tests" consistent with the ADEQ proposal.

BART for SO_2

AEPCO has already made the following upgrades to the scrubbers: elimination of flue gas bypass; splitting the limestone feed to the absorber feed tank and tower sump; upgrade of the mist eliminator system; installation of suction screens at pump intakes; automation of pump drain valves, and replacement of scrubber packing with perforated stainless steel trays. In addition, AEPCO tried using dibasic acid additive, but found that it did not result in significantly higher SO_2 removal. ADEQ determined that BART for SO_2 emissions was no new controls and an emission limit of 0.15 lb/mmBtu on a 30-day rolling average basis.

EPA R9 is proposing to approve ADEQ's SO_2 BART determination for Apache Units 2 and 3 on the basis that, "We have no evidence that additional analysis would have resulted in a lower emission limit." However, EPA R9 is seeking comment on whether additional cost-effective scrubber upgrades are available that would warrant a lower emission limit. EPA R9 is also requesting comment on whether requiring 90% control efficiency in addition to the lb/mmBtu limit would better assure proper operation of the upgraded scrubbers when burning some types of low-sulfur western coal.

The AEPCO BART reports indicate that uncontrolled SO_2 emissions are 0.69 lb/mmBtu, and the ADEQ/EPA R9 proposal reduces SO_2 emissions by 78% down to 0.15 lb/mmBtu. As noted above, other BART upgrades are achieving higher removal efficiencies and/or lower SO_2 limits. It is clear that existing scrubbers can be upgraded to achieve better removal efficiency and lower emission rates than the 78% and 0.15 lb/mmBtu proposed by EPA R9.

Arizona Public Service (APS) Cholla Power Plant

The Cholla Power Plant consists of four primarily coal-fired electricity generating units with a total plant-wide generating capacity of 1,150 megawatts. According to CAMD, in 2011, out of 1,237 facilities, Cholla ranked #183 for SO_2 (6,738 tons) and #45 for NO_X (10,995 tons). EPA modeling estimated that Cholla has a 4.53 dv impact at Petrified Forest National Park and 18.30 dv across 13 Class I areas within 300 km.

Cholla Units 2, 3 and 4

Units 2, 3 and 4 have capacities of 300 MW, 300 MW and 425 MW, respectively, and are tangentially-fired, dry-bottom boilers that are each BART-eligible. (Unit 1 is a 125 MW tangentially-fired, dry-bottom boiler that is not BART-eligible.) Based on information provided by APS, the Cholla units operate on a blend of bituminous and sub-bituminous rank coals from the Lee Ranch and El Segundo mines.

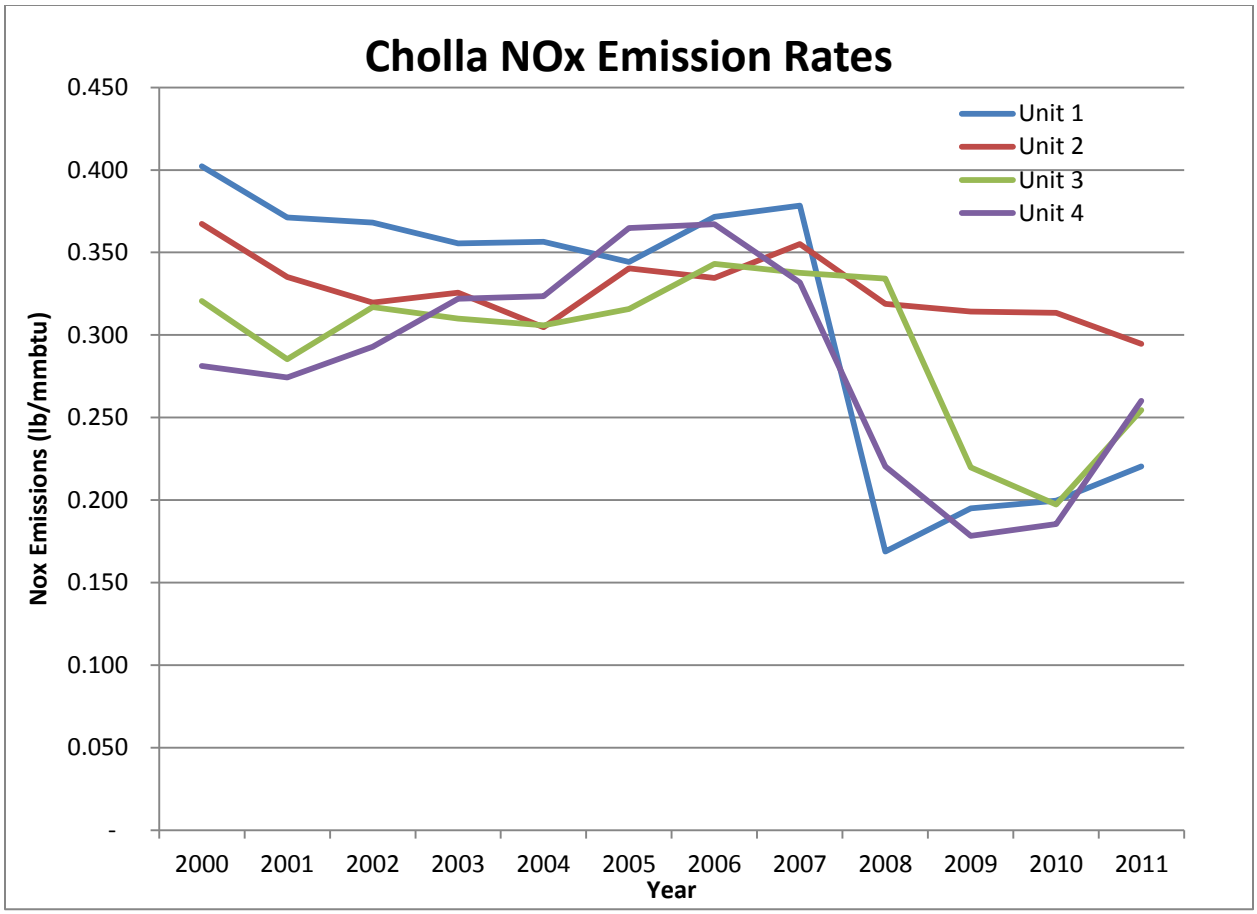
According to CAMD, in 2011, out of 3,621 units, Cholla #2 ranked #553 for SO_2 (1,994 tons) and #183 for NO_X (3,118 tons). Cholla #3 ranked #620 for SO_2 (1,613 tons) and #209 for NO_X (2,833 tons). Cholla #4 ranked #532 for SO_2 (2,083 tons) and #117 for NO_X (3,909 tons).

BART for NO_X

Selection of Baseline Period: APS' BART analysis used a 2001-03 time period in order to establish its baseline NO_X emissions. The NO_X control technology present on Cholla Units 2 through 4 during that time period was close-coupled over fire air (COFA). APS has since installed low- NO_X (LNB) burners with separated over fire air (SOFA) on Cholla Units 2 through 4.

EPA R9 initially planned to use the three-year period from 2008 to 2010 as its baseline. However, the use of a 2008 to 2010 baseline was complicated by the fact that the Cholla plant operates under a new coal contract for Lee Ranch/El Segundo coal, which is a higher NO_X-emitting coal than what was previously used. This coal contract indicates that steadily increasing minimum quantities of coal shall be delivered. As a result, 2011 represents the first complete calendar year at which it is certain that the Cholla plant operated at the new coal contract's "full" minimum purchase quantity of 3,700,000 tons per year. EPA R9 therefore selected 2011 as the time period for establishing baseline annual NO_X emissions.

As noted above, we generally prefer to use the pre-control emissions. However, in this case, we agree with EPA R9's use of the most recent emissions as representative of future emissions with the new coal. The impact of the additional combustion controls and the new, higher-NO_X coal may be seen in the figure below.



Summary of Control Cost Estimates: EPA's calculations indicate that the SCR-based control options have average cost-effectiveness values of $3,114/ton to $3,472/ton, which falls in a range that EPA considers cost-effective. Our analysis arrived at similar estimates of $3,057/ton to $3,547/ton for the incremental costs of adding SCR to the new combustion controls. (Please see Appendix D. Cholla SCR Costs.)

Unit	Unit 2	Unit 3	Unit 4	Totals
SCR Cost-benefit Analysis				
Control Efficiency	83%	80%	80%	
Controlled emissions (lb/mmBtu)	0.05	0.05	0.05	
Controlled Emissions (tpy)	537	555	746	1,838
Emissions Reduction (tpy)	2,627	2,270	3,048	7,944
Capital Cost	$ 62,030,196	$ 61,378,257	$ 84,321,125	$ 207,729,578
Capital Cost ($/kW)	$ 207	$ 205	$ 198	$ 203
O&M Cost	$ 2,174,960	$ 2,084,761	$ 2,851,139	$ 7,110,860
Annualized Cost	$ 8,030,172	$ 7,878,434	$ 10,810,457	$ 26,719,063
Cost-Effectiveness ($/ton)	$ 3,057	$ 3,471	$ 3,547	$ 3,363
Visibility analyses				
Visibility Impact before BART (dv at Max Class I)				4.53
Visibility Impact after BART (dv at Max Class I)				3.19
Visibility Improvement (dv at Max Class I)				1.34
Cost-Effectiveness ($/98th % dv at Max Class I)				$ 19,939,599
Visibility Impact before BART (dv at Summed Class I)				18.3
Visibility Impact after BART (dv at Summed Class I)				11.09
Visibility Improvement (dv at Summed Class I)				7.21
Cost-Effectiveness ($/98th % dv at Summed Class I)				$ 3,705,834

Visibility Improvement

In its Technical Support Document, EPA R9 reports:

> The area with the greatest dv improvement was the Petrified Forest National Park; the improvement from SNCR was just under 0.5 dv and from SCR was 1.3 dv. Either of these improvements would contribute to improved visibility, with SCR being the superior option for visibility. The corresponding cumulative improvements are 2.7 and 7.2. Only SCR gives improvements exceeding 0.5 dv, and it does so at eight areas, two of which have improvements above a full 1 dv.

While we agree with EPA R9's analysis, we caution against any implication that visibility improvement must exceed 0.5 dv in order to be significant—such an approach would be contrary to the BART Guidelines.

Our results were also similar to EPA R9's estimates for the two "dollars per deciview" measures of cost-effectiveness. For the metric, "$/max dv", we estimated $19.9 million. For "$/cumulative dv", we estimated $3.7 million.

EPA's BART Determination

We agree with EPA R9's conclusions that:

- The improvement associated with the most stringent option, SCR with LNB and OFA, is substantial.
- SCR with LNB and OFA is cost-effective on average basis as well as on an incremental basis when compared to the next most stringent option, SNCR with LNB and OFA.
- NO_X BART for Cholla Units 2, 3, and 4 is SCR with LNB and OFA, with an associated emission limit for NO_X on each of Units 2, 3, and 4 of 0.050 pounds per million British thermal units (lb/MMBtu), based on a rolling 30-boiler-operating-day average.

BART for PM_{10}

Cholla Units 3 and 4 are both equipped with fabric filters for PM_{10} control, while Cholla Unit 2 was equipped with a mechanical dust collector and a Venturi scrubber. In its BART analysis, ADEQ noted that the facility had committed to install a fabric filter at Unit 2 by 2015. ADEQ also noted that "PM_{10} emissions will be measured by conducting EPA Method 201/202 tests."

We agree with EPAR9's evaluation that:

> Given that ADEQ has chosen the most stringent control technology available and set an emissions limit consistent with other units employing this technology, we are proposing to approve this BART determination of an emission limit of 0.015 lb/MMBtu for PM10 at Cholla Units 2, 3 and 4.

BART for SO_2

Cholla Units 2, 3 and 4 are all equipped with wet lime scrubbers for SO_2 control. Specifically, Unit 2 is equipped with four Venturi flooded disc scrubbers/absorber with lime reagent, capable of achieving 0.14 lb/mmBtu to 0.25 lb/mmBtu of SO_2. Units 3 and 4 were retrofitted in 2009 and 2008, respectively, with scrubbers capable of achieving 0.15 lb/mmBtu of SO_2.

Based on a limited five-factor analysis, ADEQ determined BART for SO_2 at Cholla Unit 2 is upgrades to the existing scrubber that would achieve a limit of 0.15 lb/mmBtu. APS had already installed the wet lime scrubbers by the time ADEQ conducted its own BART analysis. Therefore, ADEQ did not consider SO_2 controls other than wet lime scrubbers for Units 3 and 4, but determined BART as use of these scrubbers with an associated emission limit of 0.15 lb/mmBtu of SO_2.

EPA R9 is proposing to approve ADEQ's BART determination for SO_2 at Cholla Units 2, 3 and 4, but is seeking comment on whether additional cost-effective scrubber upgrades are available that would warrant a lower emission limit. As noted above, other BART upgrades are achieving higher removal efficiencies and/or lower SO_2 limits. It is clear that existing scrubbers can be upgraded to achieve lower emission rates than the 0.15 lb/mmBtu proposed by EPA R9.

Salt River Project (SRP) Coronado Units 1 and 2

Coronado Generating Station consists of two EGUs with a total plant-wide generating capacity of over 800 MW. Units 1 and 2 are both dry-bottom, turbo (wall)-fired boilers, each with a gross unit output of 411 MW. Both units are BART-eligible and are coal-fired boilers operating on primarily Powder River Basin sub-bituminous coal. According to CAMD, in 2011, out of 1,237 facilities, Coronado ranked #174 for SO_2 (7,352 tons) and #48 for NO_X (10,186 tons). Out of 3,621 units:

- Coronado #1 ranked #246 for SO_2 (5,086 tons) and #66 for NO_X (5,014 tons).
- Coronado #2 ranked #507 for SO_2 (2,266 tons) and #62 for NO_X (5,172 tons).

EPA modeling estimated that Coronado has a 1.23 dv impact at the Gila Wilderness Area and 6.54 dv across 17 Class I areas within 300 km.

BART for NO_X

We agree with EPA R9 that, "SRP did not provide ADEQ with control cost calculations at a level of detail that allowed for a comprehensive review."

We agree with EPA R9 that ADEQ's BART selection of LNB with OFA for Coronado is not adequately supported:

- ADEQ did not consider the typical visibility metrics of benefit at the area with maximum impact, nor benefits summed over the areas.
- Using the default 1 ppb ammonia background concentration would also have increased estimated impacts and control benefits.
- There is no weighing of the visibility benefits and visibility cost-effectiveness for the various candidate controls and the various Class I areas.
- ADEQ does not indicate whether or not it considered any cost thresholds to be reasonable or expensive in analyzing the costs of compliance for the various control options.

Selection of Baseline Period and Baseline Control Technology: SRP's BART analysis used a 2001-03 time period in order to establish its baseline NO_X emissions. Since that time period, SRP has installed LNB with OFA on Coronado Units 1 and 2. Based on CAMD documentation, the low-NO_X burners were installed on Coronado Unit 1 on May 16, 2009. EPA R9 decided to use CAMD emission data corresponding to the post-LNB period extending from May 16, 2009 to December 31, 2010. For Coronado Unit 2, although the SCR system has not yet been installed, the 0.080 lb/mmBtu limit is federally enforceable and represents a realistic depiction of anticipated future emissions. As noted above, we generally prefer to use the pre-control emissions.

Summary and Conclusions Regarding Costs of Control: For Coronado 1, EPA R9 estimated that the SCR-based control option has an average cost-effectiveness value of $2,405/ton which it considers cost-effective. Our analysis arrived at a similar estimate of $2,540/ton for the incremental costs of adding SCR to the new combustion controls. (Please see Appendix E. Coronado SCR Costs.)

EPA R9's analysis for Coronado 2 relied upon SCR at an emission rate of 0.08 lb/MMBtu as a baseline scenario. As a result, the only control option examined for Coronado 2 was an SCR-based option at 0.05 lb/MMBtu. EPA R9's initial analysis indicates that the incremental cost-effectiveness of such an option is $583/ton, making it a control option that it would consider cost-effective. However, EPA R9 received information from SRP indicating that design and construction of the SCR system for this unit are well under way. In its letter, SRP states that "if SRP were required to abandon the current design, incur procurement losses, possibly remove foundations, and undertake new design and procurement, such steps would vastly increase the cost of the SCR retrofit."

EPA R9 states that it:

> intend(s) to request further documentation in order to determine the extent of these costs and how they would affect our cost-effectiveness calculations. We will include all non-CBI material received in the docket for this action and will consider it as part of our final action. We are specifically interested in information from SRP concerning the number of layers of catalyst for the SCR at Unit 2, how they plan to manage replacement of the catalyst, and whether the catalyst could be installed and managed to allow Unit 2 to meet a lower emission limit than 0.08 lb/MMBtu.

We do not see that information in the docket and can only base our comments upon application of EPA's CCM to evaluate the differences between an SCR on Coronado #2 at 0.05 lb/mmBtu versus 0.08 lb/mmBtu. We estimate that a SCR reactor designed to achieve 0.05 lb/mmBtu

would have essentially the same "footprint" but require one additional layer of catalyst and be seven feet taller than an SCR designed for 0.08 lb/mmBtu—the relevant design parameters are tabulated below.

SCR @	0.05	0.08	lb/mmBtu
Volume of catalyst =	15,751	17,197	ft3
Area of catalyst =	2,049	2,049	ft2
l = w =	48.5	48.5	ft.
Number of layers (total) =	3	4	
Height of SCR =	45	52	ft.

Visibility Improvement

EPA is proposing SCR at 0.05 lb/mmBtu on Unit 1 and SCR at 0.08 lb/mmBtu on Unit 2. The area with the greatest dv improvement was the Gila Wilderness Area; there is an improvement of 0.7 dv from SCR on unit 1 and 0.9 dv from SCR at 0.05 lb/mmBtu on both units. These improvements are smaller than for the other facilities because the benefit from SCR at 0.08 lb/mmBtu on unit 2 is subsumed in the baseline. The cumulative improvements corresponding to these control scenarios are 2.8 dv, and 3.1 dv.

EPA R9's NO_X BART Determination

We agree with EPA R9's determination that NO_X BART for Coronado Units 1 and 2 is SCR with LNB and OFA. At Unit 1 EPA R9 proposes an emission limit for NO_x of 0.050 lb/MMBtu, based on a rolling 30-boiler-operating-day average.

At Unit 2, EPA R9 proposes an emission limit of 0.080 lb/MMBtu, which is consistent with the emission limit in the consent decree. EPA R9 acknowledges that the emission limit of 0.080 lb/mmBtu established in the consent decree was not the result of a BART five-factor analysis, and that the consent decree does not indicate that SCR at 0.080 lb/mmBtu represents BART. We commend EPA R9 for soliciting additional information on the feasibility of achieving a more-stringent limit.

BART for PM_{10}

Emissions of PM_{10} from Coronado Units 1 and 2 are currently controlled by hot-side ESPs. Under the terms of the Consent Decree, SRP is required to optimize its ESPs to achieve a PM_{10} emission rate of 0.030 lb/mmBtu.

EPA R9 expressed concerns that use of SCR at these units is expected to result in increased condensable particulate matter in the form of sulfuric acid mist (H_2SO_4). EPA R9 states that:

> In effect, the emission limit would be more stringent than intended by ADEQ and would likely not be achievable in practice. EPA is requesting comment on whether to allow compliance with the PM10 limit to be demonstrated using test methods that do not capture condensable particulate matter, namely EPA Methods 1 through 4 and Method 5 or Method 5e.

We do not believe that H_2SO_4 emissions will be significant. Our application of the EPRI method for estimating H_2SO_4 emissions results in an additional 0.0027 lb/mmBtu from SCR for each unit. (Our estimate is consistent with the estimates provided in UNC tables A-1 (b) and A-3(b).)

Thus, H_2SO_4 from SCR would contribute less than 10% to the PM_{10} limit. (Please see Appendix F. Coronado H2SO4.) As with Apache, we suggest that the 0.030 lb/mmBtu limit proposed by ADEQ could be adjusted to 0.033 lb/mmBtu to reflect the increase in Total PM_{10} attributable to SCR. PM_{10} emissions would be measured by conducting EPA Method 201A/202 tests consistent with the ADEQ proposal.

***BART for* SO_2**

Emissions of SO_2 at Coronado Units 1 and 2 are currently controlled with the use of low sulfur coal and partial wet flue gas desulfurization (WFGD). However, the consent decree between EPA and SRP requires installation of WFGD systems on both units to achieve a 30-day rolling average SO_2 removal efficiency of at least 95.0 percent or a 30-day rolling average SO_2 emissions rate of no greater than 0.080 lb/mmBtu. EPA R9 proposes to approve ADEQ's SO_2 emission limit of 0.08 lb/mmBtu (30-day rolling average) for Coronado Units 1 and 2. This would be consistent with the more-stringent limits on WFGD upgrades that we have seen.