National Park Service
Comments on the Basin Electric—Dry Fork Power Plant
Prevention of Significant Deterioration Permit Application
March 28, 2007

Introduction

Basin Electric Power Cooperative (BEP) proposes to construct and operate a new 440 (gross) MW pulverized sub-bituminous coal-fired Dry Fork power plant near Gillette, WY. The proposed site is about 180 kilometers northwest of Wind Cave National Park (NP), and about 220 kilometers northwest of Badlands NP, both Prevention of Significant Deterioration (PSD) Class I areas administered by the National Park Service (NPS). Class II areas within 300 km and also administered by NPS include Devil's Tower National Monument (65 km), Mt. Rushmore National Memorial (146 km), and Jewel Cave National Monument (150 km).

This proposed permit is being issued under the PSD Program. The purposes of the PSD program include to "preserve, protect and enhance the air quality in national parks, wilderness areas and other areas of natural, recreational, scenic or historic value" and "insure economic growth will occur in a manner consistent with the preservation of existing clean air resources." 42 U.S.C. 7470. In other words, the purpose of the PSD program is to manage growth in the context of environmental protection. For this permit application, the environmental protection context includes consideration of impacts on our Class I and Class II areas. The Clean Air Act gives the Federal Land Manager (FLM) an affirmative responsibility to protect Air Quality Related Values (AQRVs) of Class I areas, like Wind Cave and Badlands National Parks.

Please note that, under the Clean Air Act, the FLM has no formal role in the permitting process except to the extent a proposed new or modified source may affect AQRVs in a Class I area. Nevertheless, the FLMs have responsibilities under other authorities (e.g., the Wilderness Act, Organic Act) to protect AQRVs in Class II Federal areas. Therefore, the information and procedures outlined in our FLAG[1] document are generally applicable to evaluating the effect of new or modified sources on the AQRVs of Class II areas managed by the FLM.

Procedural Concerns

Under 40CFR52.21(p)(1), the FLM should be provided all information relevant to the permit application within 30 days of receipt and at least 60 days prior to the public hearing. We appreciate that WY AQD was very prompt in providing the initial application and the March and June 2006 follow-ups from BEP to WY AQD. Those follow-up documents demonstrate that WY AQD was fulfilling its responsibility to conduct a thorough evaluation of the proposal and exploring ways to reduce emissions, and we commend WY AQD for that effort. For example, as a result of WY AQD's efforts, the following significant changes occurred subsequent to the original application:

- SO_2 emissions dropped from 1625 to 1332 tpy.
- NOx emissions dropped from 1317 to 832 tpy

[1] Information on our FLAG document can be found at: http://www2.nature.nps.gov/air/permits/flag/index.cfm

- Filterable PM_{10} emissions dropped from 276 to 200 tpy.

However, it was not until February 22, 2007, that we received official Notice from WY AQD that the public comment period had begun and was to end on March 28. It was then that we first learned that the application was considered complete by WY AQD, and we first saw the proposed permit conditions.

We believe that it would be both unproductive and confusing to the public for us to make an adverse impact determination on any application that is still undergoing review and revision. Therefore, we typically depend upon permitting authorities to provide us with the draft permit and staff analysis at least 30 days before publishing their formal notice. This allows us time to fully review the near-final permit.

Instead, WY AQD did not provide its formal Public Notice, staff analysis, or the draft permit conditions necessary for NPS to evaluate WY AQD's conclusions until publication of the Notice. Without this information, it was impossible for us to know what emission limits were actually being proposed by WY AQD and to thoroughly evaluate the impacts of those emissions in time for relevant comments. Furthermore, the FLM should have been provided the opportunity to submit a visibility analysis within 30 days of the WY AQD's preliminary determination and before announcing the public hearing. Consequently, we did not have adequate time to consider the draft permit package or determine if the potential imparts are adverse before the public notice was published. This compromises the public's ability to comment on this important issue, as envisioned by procedural requirements in the federal regulations. WY AQD should therefore extend the public comment period and conduct a Public Hearing.

Proposed Emissions & Controls

Sulfur dioxide (SO_2) emissions would be controlled to 1331.8 tpy @ 0.08 lb/mmBtu (12-month rolling average) and 380.1 lb/hr (3-hour block average) by a Spray Dry Absorber (SDA); nitrogen Oxides (NO_x) to 832.4 tpy @ 0.05 lb/mmBtu (12-month rolling average) by Selective Catalytic Reduction (SCR); and filterable particulate (PM_{10}) to 199.8 tpy @ 0.012 lb/mmBtu by a fabric filter (baghouse). Sulfuric acid mist (H_2SO_4) emissions would be 42 tpy and controlled by the SO_2 scrubber. Mercury (Hg) emissions would be limited to 320 lb/yr, with the potential for addition of mercury controls pending further study. We estimate that total PM_{10} emissions would be 853 tpy.

Best Available Control Technology (BACT) Analysis

Based on the review and analysis of the materials received, we believe the proposed emissions from the Dry Fork facility would significantly impact resources at Wind Cave NP (see discussion below). Therefore, it is important that impacts at Wind Cave NP be lessened. We believe that the Dry Fork facility could achieve lower emission limits by choosing an inherently cleaner coal utilization technology, or by making more effective use of the control technologies chosen for the Pulverized Coal (PC) boiler. Please note that it is generally understood that a source impacting a national park is held to a higher standard and may be required to install additional controls or take additional operational measures to minimize impacts at these national treasures.

Clean Coal Technologies

A fundamental principle of pollution control is that it is generally desirable to avoid creating the pollution in the first place. We believe that a technological solution is now available that would allow use of local coal to generate electricity without the large quantities of emissions associated with pulverized coal-fired boilers. The Integrated Gasification Combined Cycle (IGCC) process has now been demonstrated by Tampa (FL) Electric at its Polk Generating Station to be clean, reliable, and economical.[2] We have received applications for six proposed IGCC facilities[3] and their relative emissions (in terms of lb/MWh_{net} for SO_2, NO_x, and filterable PM_{10} and in lb/GWh_{net} for mercury) are shown in Figure 1 (attached) along with Dry Fork. It is clear that IGCC is a cleaner coal-to-energy technology than that proposed by BEP.

While IGCC is currently 10% to 20% more expensive to build than an equivalent PC facility, energy industry experts contend that that cost disadvantage will be partially or entirely offset when national legislation requires carbon dioxide (CO_2) capture and sequestration. While switching to IGCC would not reduce the millions of tons of CO_2 produced by the Dry Fork facility every year, those millions of tons would be concentrated in the IGCC exhaust by a factor of 10 to 100 times smaller than the exhaust from a PC, thus reducing the inevitable cost of capture by one – two orders of magnitude.

Furthermore, energy industry leaders such as General Electric have recently acquired the capability to build a complete 600 MW IGCC facility, for the first time bringing all the components of IGCC together in an integrated and cost-effective package. GE expects this approach alone will reduce the IGCC capital cost "penalty" to no more than 10%.

While it is true that no IGCC has yet been successfully demonstrated using western sub-bituminous coal or at high altitude, neither has a reason been demonstrated that these issues are insurmountable. We are currently aware of two western IGCC projects (Bowie in AZ and Xcel in CO) that are moving toward reality, as well as western states (WY, CO, and MT) that have adopted policies to promote western IGCC projects. IGCC has one more additional and very significant benefit in the arid west—it uses far less water than a PC boiler.

All things considered, we believe it is time for new power generators to take a serious look at the sorts of "Clean Coal Technologies" being promoted by our administration as it seeks to relieve our dependence upon foreign energy sources while protecting our environment. We also believe that IGCC is a leading candidate for that role, and should be considered by BEP.

Conventional PC Boiler BACT

Even for a PC boiler, the Dry Fork project suffers by comparison to more-efficient designs. It appears that Dry Fork is a relatively conventional PC boiler design, as opposed to the supercritical and ultra-supercritical designs at Sithe's Desert Rock project and Florida Power &

[2] At a recent workshop in Denver on clean coal technology, a representative of Tampa Electric related that the Polk IGCC is now its most reliable unit in its system and is dispatched first because it is also the most economical.
[3] American Electric Power-Mountaineer (WV), Cash Creek (KY), Excelsior Energy-Mesaba (MN), Southern Co.-Orlando (FL), Pacific Mountain Energy Company (WA), Steelhead (IL)

Light's Glades project, respectively. As a result, Dry Fork will produce less electricity per unit of heat input, and, consequently, produce more emissions per energy output.

SO_2: WY AQD has proposed as BACT a SDA (Spray Dry Absorber) with an emission limit of 0.08 lb SO_2/mmBtu on a 12-month rolling average basis. After one accounts for the sulfur remaining in the ash, this amounts to a removal efficiency of 92.4% on an uncontrolled emission rate of 1.05 lb/mmBtu.

In comparing the performance of SO_2 scrubbers, one must consider that it is easier to achieve a higher control efficiency on a gas stream with a higher inlet SO_2 concentration, but more difficult to achieve a lower outlet concentration.[4] The uncontrolled emission rates (bolded values) in Table 1 (attached) are derived from the sulfur and heat contents of the coals burned, as well as the uncontrolled emission factors from EPA's "Compilation of Air Pollutant Emission Factors" (AP-42). So, if one can achieve higher control efficiency (bolded values) on a "cleaner" gas stream, it would indicate a higher degree of scrubbing success. Likewise, if one can achieve a lower emission rate (bolded values) on a "dirtier" gas stream, more successful scrubbing would again be indicated.

Thus, by comparison (see Table 1.d.), the Newmont Nevada and the LS Power White Pines and High Plains projects are proposing to achieve better than 93% SO_2 control with dry scrubbers on gas streams that are cleaner than that of Dry Fork. This indicates that those projects would be making more effective use of their dry scrubbing technology.[5]

The Desert Rock, Sierra Pacific-Ely, and FPL-Glades projects are proposing to use wet Flue Gas desulfurization scrubbers (WFGD) to meet annual SO_2 limits of 0.06, 0.06, and 0.04 lb/mmBtu (respectively) on dirtier gas streams. This again indicates that those projects would be making more effective use of their scrubbing technology.[6] WY AQD considered application of wet scrubbing technology, and determined that the average cost effectiveness of wet scrubbing was "reasonable". However, WY AQD then calculated that the incremental cost effectiveness[7] of $15,299/ton was "excessive when combined with the negative environmental impacts[8] of wet FGD." However, because we have presented examples of other wet scrubbers with lower emission rates, AQD must show why the incremental costs at Dry Fork are greater than at Desert Rock and Glades, that the "negative environmental impacts" at Dry Fork are also greater, or that the combination of factors at Dry Fork is significantly different from the other examples.

WY AQD has tried to justify its choice of dry scrubbing because it is cheaper, is less likely to create a steam plume, has lower particulate, acid mist, and mercury emissions[9], and uses less water than the wet scrubbers proposed for Desert Rock and Glades. While some, but not all, of these factors are true in general, they do not necessarily decide BACT in favor of dry scrubbing—if that were the case, no new facilities would ever use wet scrubbers. WY AQD must

[4] It follows that it is harder to achieve a higher control efficiency on a gas stream with a lower inlet SO_2 concentration, but easier to achieve a lower outlet concentration.
[5] A similar pattern is evident for the other averaging periods shown in Table 1.
[6] A similar pattern is evident for the other averaging periods shown in Table 1.
[7] WY AQD should re-calculate its costs based upon the lower achievable emission rates we have cited.
[8] WY AQD should also consider the positive environmental impacts of lower SO_2 emissions.
[9] We shall show in the following discussions that these assumptions are not necessarily correct.

show that application of wet scrubbing technology would present unique disadvantages at its specific site relative to other wet scrubber installations such as Desert Rock and Glades—it has not done so. And, to minimize water consumption, WY AQD should encourage IGCC technology which uses far less water.

NO_x: WY AQD has proposed as BACT Low NO_x Burners and SCR with an emission limit of 0.05 lb NO_x/mmBtu on a 12-month rolling average basis. While this is the lowest PC NO_x emission limit we have seen in terms of lb/mmBtu, it is still somewhat higher in terms of emissions per energy output than the limit proposed for Glades (see attached Table 2) due to the higher efficiency of the Glades boilers.

PM_{10}: WY AQD has proposed as BACT a baghouse with a limit of 0.012 lb filterable PM_{10}/mmBtu. No limit is proposed for condensable emissions. We are now aware of three (Sithe's Desert Rock and Toquop, and the Two Elk Expansion) projects with lower proposed or permitted limits on filterable of 0.010 lb/mmBtu (see attached Table 3). Once again, WY AQD calculated that the incremental cost effectiveness[10] of $30,771/ton was "excessive" without showing why this incremental cost was higher than those at the three examples cited above. WY AQD must show why the incremental costs at Dry Fork are greater than at Desert Rock, Toquop, and Two Elk Expansion.

H_2SO_4: The use of dry scrubbing avoids the creation of H_2SO_4 typical of a wet scrubbing system. Since control of H_2SO_4 is related to control of SO_2, BACT for SO_2 would typically result in BACT for H_2SO_4. While WY AQD cited lower H_2SO_4 emissions as a reason for selecting dry scrubbing over wet scrubbing, it should be noted that the proposed H_2SO_4 limit is higher than the wet scrubber proposed by Cash Creek and the dry scrubber proposed by Newmont (see attached Table 4). If acid mist emissions are so important as to preclude use of a wet scrubber, then WY AQD should lower its sulfuric acid mist limit to reflect the degree of control to be achieved by the dry scrubber at Newmont.

Hg: WY AQD has proposed that mercury controls be installed, that mercury emissions be studied, and that the permit be re-opened later if the results of the study warrant an emission limit lower than that proposed. However, Table 5. (attached) shows six examples of coal-fired power plants with lower mercury limits than proposed, and two of those examples have limits below even WY AQD's "target" limit of $20x10^{-6}$ lb/MWh.

We do not understand WY AQD's concern that adding a wet scrubber will increase Hg emissions. Of the six examples cited above, three will use wet scrubbers. If mercury emissions are so important as to preclude use of a wet scrubber, then WY AQD should lower its mercury limit to reflect the degree of control to be achieved by the dry scrubbers cited above.

Figure 2 (attached) illustrates the differences in emissions among the proposals discussed above. It can be seen that, on an emission-per-energy output basis, Dry Fork would emit significantly more SO_2, PM_{10}, and mercury than other PC boiler projects. In summary, we believe that the Dry Fork facility could achieve lower SO_2, PM_{10}, H_2SO_4, and mercury limits than currently proposed in the application.

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[10] WY AQD should re-calculate its costs based upon the lower achievable emission rates we have cited.

Compliance Monitoring

We recommend that a Continuous Emissions Monitor (CEM) requirement for PM be added. For example, the West Virginia Division of Air Quality (WVDAQ) has required that PM emissions be monitored by a CEM within 18 months of boiler start-up or when performance specifications for such monitors are promulgated, whichever comes later.[11] We continue to believe that CEMs are an important tool for monitoring compliance. For that reason, we recommend that a PM CEM be installed upon startup.

Applicant's Air Quality/ Air Quality Related Values (AQRV) Modeling Analysis Methodology and WY AQD Proposed Limits

Single Source Analysis: Short-term emission rates modeled vary drastically, as illustrated in Table 6.

Table 6. Emission rates modeled for 24-hour impacts on visibility

Lb/hr Modeled by	SO2	NOx	Coarse PM10	Fine PM10	EC	IOR CPM	OR CPM	Total PM10
BEP	380.1	266.1	0	48.9	0.0	21.3	5.6	75.7
WY AQD	380.1	266.1	0	51.5	0.0	10.4	1.9	63.8
NPS	380.1	266.1	0	45.6	0.0	119.3	29.8	194.7
Proposed limits	380.1			45.6				

We agree that the emission rates contained in Table 8-3 of the application for SO_2 and NO_x are consistent with those modeled. However, the only permit limits proposed for NO_x emissions reflect 30-day and 12-month rolling averages, which are inconsistent with the 24-hour average model output. We have previously advised WY AQD that permit limits should be consistent with model emission rates, but WY AQD chooses not to specify appropriate short-term limits. As a result, although BEP modeled a higher emission rate than contained in the proposed permit, there is no way to insure that actual 24-hour emissions, and consequent impacts on visibility, will not exceed the rates modeled.

We have a similar problem with respect to PM_{10} emissions. While there is reasonably close agreement as to the appropriate filterable (coarse + fine + elemental carbon (EC)) PM_{10} emission rate and the corresponding proposed permit limit, there is wide disagreement among the rates modeled for condensable PM_{10} emissions[12] and proposed (or lack thereof) permit limits.

Since the November 2005 submittal of the application, NPS has developed methods based upon EPA AP-42 emission factors to estimate the rates of emissions for each of the species that comprise PM_{10} emissions; a summary of our estimates is shown in Table 6. By comparison, the modeling analyses submitted by BEP and WY AQD estimate significantly lower emissions of

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[11] Those CEM Performance Specifications were later promulgated by EPA on 1/12/04.

[12] The PM_{10} values for BEP's model come from Table 3 of its 6/14/06 submittal.

both inorganic (IOR CPM) and organic condensibles OR CPM), and their consequent impacts upon increment and visibility.

To its credit, WY AQD requested that BEP address the quantification of condensable PM_{10} and, if the calculated emission rates are revised, submit a new modeling analysis. In BEP's June 2006 response, it asserted that there is uncertainty both in estimating and in measuring condensable PM_{10} emissions—we agree. Furthermore, we agree with the approach taken by BEP to estimate (higher) condensable PM_{10} emissions, as explained in its June 2006 submittal and presented in Table 2 of that submittal. And, we are very familiar with the work of Corio & Sherwell cited by BEP in its argument against use of EPA Method 202 to test for condensable PM_{10} emissions. However, we disagree that Method 202 is not appropriate to test condensable emissions from a PC boiler and to check BEP's assumptions. We understand that EPA has made considerable progress in understanding and addressing the issue of a positive bias in Method 202 and we support WY AQD's inclusion of a requirement that BEP test for condensable PM_{10} using Method 202. However, it appears that, despite BEP submitting its revised PM_{10} emission estimates and modeling results in June 2006, WY AQD has used the old, much-lower emission rates from the November 2005 submittal to conclude that there would be no significant impact on Class I increments at Wind Cave or Badlands National Parks, on any Class II increments, and to generate its estimates of visibility impairment. WY AQD should revise its analyses to reflect the higher estimates provided by BEP and NPS.

And, to further exacerbate the problem of the modeling not matching the emissions, WY AQD continues to omit any limit on condensable emissions (including H_2SO_4) in its permits. Although WY AQD states in its staff analysis that, "If the results [of the Method 202 testing] are higher than the assumptions used in the modeling, the Division will assess the need for additional modeling," there is no guarantee that such a re-assessment will be open for public and FLM review and comment, or what recourse the FLM would have if such a review indicated potential increment violations and/or adverse impacts. This leaves us, in the absence of enforceable permit limits, to model the emission that we believe to be most protective of our resources. The results of our analysis are discussed in the following section of this report.

Class I Air Quality Impact Analysis Results

PSD Increment Consumption:

BEP's PSD Class I increment modeling results purport to show that it would not have a significant impact upon Class I increments at Wind Cave or Badlands National Parks. Therefore, no cumulative increment analysis was required there.

Visibility

The PSD application reported visibility impact results for the Dry Fork facility by itself over the three-year modeling period. Those results are shown in Table 7.a. below.

Table 7.a. – BEP's Class I Visibility Modeling Results (2001 – 2003)

Dry Fork Project Only	Badlands National Park	Wind Cave National Park
Maximum Change (2002)	5.8%	9.1%
Days over 5%	2	7
Days over 10%	0	0

Although BEP tried to dismiss the results for days with change in extinction greater than 5%, NPS policy is that such demonstrations should be made on a more-specific, hour-by-hour basis. Taken at face value, these results indicate the need for a cumulative analysis of visibility impacts from this and other sources in the area.

Table 7.b. shows the results of WY AQD's analysis for 2003.

Table 7.b. – WY AQD's Class I Visibility Modeling Results (2003)

Dry Fork Project Only	Badlands National Park	Wind Cave National Park
Maximum Change	10.7%	5.6%
Days over 5%	5	2
Days over 10%	1	0

The WY AQD results indicate the need for a cumulative analysis of visibility impacts from this and other sources in the area.

Table 7.c. shows the results of NPS' analysis for 2003.

Table 7.b. – NPS' Class I Visibility Modeling Results (2003)

Dry Fork Project Only	Badlands National Park	Wind Cave National Park
Maximum Change	7.7%	12.5%
Days over 5%	3	9
Days over 10%	0	3

The NPS results indicate the need for a cumulative analysis of visibility impacts from this and other sources in the area, and that Dry Fork may have the potential to adversely impact visibility in Wind Cave National Park by itself.

The diversity of the results indicates the need for further review and analysis of proposed emissions, and that the recommendations presented above for reducing emissions for visibility-impairing pollutants (SO_2, NOx, PM_{10}, H_2SO_4) should be given additional consideration to relieve these potentially significant impacts at these Class I areas.

Cumulative Source Analysis: Under the federal Regional Haze Rule (RHR), states are to make "reasonable progress" toward the national goal of natural visibility by 2064. As part of that program, states are to assess the effects of reducing emissions from existing sources, as well as increases in emissions from new sources. WY AQD must present its plan for implementing the RHR by December 17, 2007, and we believe it is appropriate for WY AQD to show how issuance of this permit, in conjunction with other growth in the area, will allow it to meet it "reasonable progress" obligation. We are especially concerned about the cumulative impacts upon visibility from the extensive development in the Powder River basin and around Wind Cave NP. Table 8 summarizes permittee and projected increases in emissions from current levels.

Table 8. New Projects near Wind Cave National Park

Project and Emissions (tpy)	SO2	NOx	PM10
BHP-Neil Simpson #2	35	298	53
BHP-Rapid City	35	289	
Dacotah Cement	1,040	2,339	197
PRB Oil & Gas	754	14,441	2,338
Two Elk	?	?	?
BHP-WYGEN 2	569	399	72
KFx Expansion	453	419	80
Basin-Dry Fork	1,332	832	76
WYGEN 3	512	285	68
Evergreen-Coal Creek	1,212	894	153
KFx-Buckskin	43	297	51
American Colloid	300	150	150
Two Elk Expansion	2,753	2,202	606
MEG House Creek		102	
Totals	9,038	22,920	3,844

<u>Deposition</u>

BEP presented the following results of sulfur and nitrogen deposition at Wind Cave and Badlands National Parks with no analysis of their impacts.

Table 9. BEP's Class I Deposition Modeling Results (kg/ha/yr)

	Deposition Analysis Threshold	Wind Cave National Park	Badlands National Park
Dry Fork Project Only			
Sulfur	**0.005**	**0.008**	0.003
Nitrogen	0.005	0.002	0.001

Dry Fork's Contribution to Sulfur Deposition and Ecosystem Impacts in Wind Cave National Park NP: BEP's modeling results predict a maximum sulfur (S) deposition impact in Wind Cave National Park of 0.008 kilograms per hectare per year (kg/ha/yr), which exceeds 0.005 kg/ha/yr, the value recommended by NPS as the sulfur Deposition Analysis Threshold (DAT).[13] The DAT is the additional amount of nitrogen (N) or S deposition within a Class I area, below which estimated impacts from a proposed new or modified source are considered insignificant. Therefore, Dry Fork's contribution to sulfur deposition in the park triggers management concern and warrants further consideration.

[13] In a January 3, 2002, letter to Mr. S. William Becker, of STAPPA/ALAPCO, the NPS and U.S. Fish and Wildlife Service notified State air agencies regarding the development of deposition analysis thresholds for sulfur and nitrogen deposition.

As discussed in "Guidance on Nitrogen and Sulfur Deposition Analysis Thresholds,"[14] the DAT is a deposition threshold, not necessarily an adverse impact threshold. The DAT is the additional amount of deposition that triggers a management concern, not necessarily the amount that constitutes an adverse impact to the environment. Adverse impact determinations are considered on a case-by-case basis for modeled deposition values that are higher than the DAT, evaluating the best scientific information available for the affected park to assess existing as well as potential future deposition impacts.

Discussion of Effects upon Resources of Wind Cave National Park: Wind Cave National Park encompasses 28,295 acres of mixed-grass prairie, ponderosa pine forest, and associated wildlife, in addition to the cave resources for which it is named. The significance of additional deposition of nitrogen and sulfur come in two areas, visibility and ecological health.

Certain features (Badlands for one at approximately 60 miles east) of the area can be seen from within the park. Air quality not only affects distance sight, but the ability to distinguish features and colors. An increase in deposition of sulfates, in particular (as they are the largest contributor to visibility degradation), impairs the ability to observe landscapes, vegetative types, geologic patterns, and even wildlife, not only at great distances, but even in the range of even yards. One of the premier experiences to national parks is observation of nature, in its own beauty. This includes seeing the shapes, features and colors. Increased deposition of air pollutants negates the ability of the National Park Service to manage resources, even air, "unimpaired for the enjoyment of future generations."

The evidence from scientific research substantiates the fact that increased nitrogen and sulfur in the atmosphere when deposited in rain or snow, or as dry deposition can be harmful to plants, soils, surface and subsurface water, and wildlife. In addition, the effects of excess nitrogen deposition on nutrient-poor ecosystems have been shown to include alteration of species richness and diversity to natural plant communities. While sulfur deposition has been decreasing at the monitoring site with long-term data nearest Wind Cave (WY99); nitrogen deposition, NO3 concentration, and NH4 concentrations have been increasing over the period of record (NADP, 2005). Therefore it is particularly important to consider cumulative impact analyses of nitrogen deposition, in the context of this new proposed source. Wind Cave National Park was established to protect two types of resources (cave and above ground ecosystems). Nitrogen oxides are precursors to ozone formation. Several species that occur within the park have been shown to be sensitive to ozone, sulfur and nitrogen deposition. Ponderosa pine (*Pinus ponderosa*) is one of the most ozone, sulfur and nitrogen sensitive conifers in north America and can exhibit symptoms of foliar chlorosis, reduced growth and other physiological changes (Miller and Millecan 1971, Pronos and Vogler 1981, Peterson and Arbaugh 1988, Temple et al. 1992, Peterson et al. 1991, Peterson and Arbaugh 1992, Darrall 1989, Bytnerowicz and Grulke 1992). Quaking aspen (*Populus tremuloides*) is also sensitive to ozone, but is also particularly sensitive to sulfur and injury is similar to that normally found for ozone (stippling, followed by bifacial necrosis) (Karnosky 1976). In addition, serviceberry (*Amelanchier alnifolia*), junegrass (*Koeleria nitida*), and Kentucky bluegrass (*Poa pratensis*) are also highly sensitive to sulfur deposition and are all important browse species supporting wildlife. Paper birch (*Betula*

[14] http://www2.nature.nps.gov/air/Pubs/pdf/flag/nsDATGuidance.pdf

papyrifera), is also common in the park and highly sensitive to sulfur deposition. Additional species present in the park that are known ozone sensitive plant species are: *Apocynum androsaemifolium, Apocynum cannabinum, Artemisia ludoviciana, Asclepias incarnate, Asclepias syriaca, Fraxinus pennsylvanica, Parthenocissus quinquefolia, Prunus virginiana, Rhus trilobata, Rudbeckia laciniata, Sambucus racemosa, and Symphoricarpos albus* (http://www2.nature.nps.gov/air/Pubs/pdf/BaltFinalReport1.pdf). All of these species are important as feeding, breeding, and cover for native wildlife and also provide a valuable portion of the visual quality of the park. Impacts to these species would represent a change to more than 50% of the major vegetative cover and alteration of terrestrial ecosystems in the park.

Summary of Modeling Results: To summarize our preliminary findings from the modeling results presented in the permit application for Dry Fork:

- BEP's modeling indicates that the Class I PSD increments for SO_2 and NO_x are not violated at Wind Cave or Badlands National Parks.
- Visibility at Wind Cave and Badlands national parks would be significantly affected by the emissions from Dry Fork alone. Additional analysis is necessary to determine if visibility would be adversely affected by the emissions from Dry Fork alone or in combination with other new and modified sources in the area.
- Sulfur deposition from Dry Fork would exceed our Deposition Analysis Threshold at Wind Cave NP, which could result in a significant impact upon the structure and ecosystems of the park. Additional analysis is necessary to determine if these AQRVs would be adversely affected by the emissions from Dry Fork alone or in combination with other new and modified sources in the area.

Class II Air Quality Impact Analysis Results

Increment: The Dry Fork PSD Class II increment modeling results indicate that it would not have a significant impact upon Class II increments at Devil's Tower National Monument.

Visibility: Although Devil's Tower National Monument is not a Class I area, NPS policies provide for protection of all areas for which we are responsible. BEP's predicted impacts on visibility at Devils Tower NM include one day with change in extinction greater than 5% (@ 5.3%).

Soils & Vegetation: BEP states that "deposition should have no adverse effect," but provided no results of deposition modeling or soils and vegetation data to support that conclusion.

Conclusions: Deposition estimates specific to Devil's Tower are needed to better evaluate the project's impacts to aquatic and terrestrial ecosystems in the park.

Potential Mitigation Measures

In addition to reducing emissions from Dry Fork as proposed above, it may be possible that sufficient emission reductions could be secured from other sources in the area to further mitigate Dry Fork's impacts at our national parks in the area.

Conclusions and Recommendations

- BEP should re-consider use of IGCC technology to utilize coal to produce energy with less pollution.
- BEP has not justified its need for a SO_2 limit that is higher than the examples presented in this report. WY AQD should justify its rejection of wet scrubbing on the basis of economic, energy, and environmental impacts. If wet scrubbing is chosen as BACT, lower SO_2 emissions could be achieved.
- WY AQD should include a permit limit on NO_x consistent with the 24-hour emissions modeled in the visibility analysis.
- BEP has not justified its need for a PM_{10} limit that is higher than the examples presented in this report. The air pollutant dispersion modeling analyses presented to date have a high degree of variability due to the widely differing assumptions used to estimate PM_{10} emissions and due to the lack of appropriate permit limits to support the emission estimates used in the modeling analyses. WY AQD should include a permit limit on total PM_{10} consistent with the 24-hour emissions modeled in the increment and visibility analyses. The limit on total PM_{10} should be federally enforceable.
- The impacts of Dry Fork's emissions upon visibility in Wind Cave and Badlands National Parks are significant. An analysis of cumulative impacts on visibility should be conducted. WY AQD should show how issuance of the proposed permit is consistent with its "reasonable progress" obligation under the RHR.
- The contribution of additional sulfur compounds into the aquatic and terrestrial ecosystems of Wind Cave NP warrants further analysis. An analysis of sulfur deposition impacts at Wind cave NP should be conducted by BEP.
- BEP should provide estimates of sulfur and nitrogen deposition in Class II areas such as Devil's Tower National Monument.
- WY AQD did not provide "all relevant information" to the FLM sufficiently in advance of the publication of the Public Notice. WY AQD should, therefore, extend the public comment period and conduct a Public Hearing.
- No permit should be issued until these outstanding issues are resolved.

Table 5. Hg

Hg			Issue	Capacity			Emission Limits			Period	Control	
Facility Name/Location	Status	Permit #	Date	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/MW)	(lb/yr)	(hr)	Type	(%)
Longview Power	issued	WV	3/1/2004	600	600	6114	2.4E-06	2.4E-06	128	3		
FPL-Glades	application	FL		2x980	1960	17400	1.1E-06	9.9E-06	170		PAC	
Newmont Nevada	issued	NV	5/5/2005	200	200	2030	2.0E-06	2.0E-05	35		PAC	
Sithe-Desert Rock	application	EPA		750	1500	13300	2.3E-06	2.0E-05	263			
LS Power-White Pines	draft permit	NV		3x530	1590	15648	2.0E-06	2.0E-05	279			
LS Pwr--High Plains	application	CO		600	600	6155	5.1E-06	5.2E-05	273			
Basin Electric--Dry Fork	draft permit	WY		385	385	3801	9.8E-06	9.7.E-05	327	8760	PAC	

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Figure 2. PC Comparisons

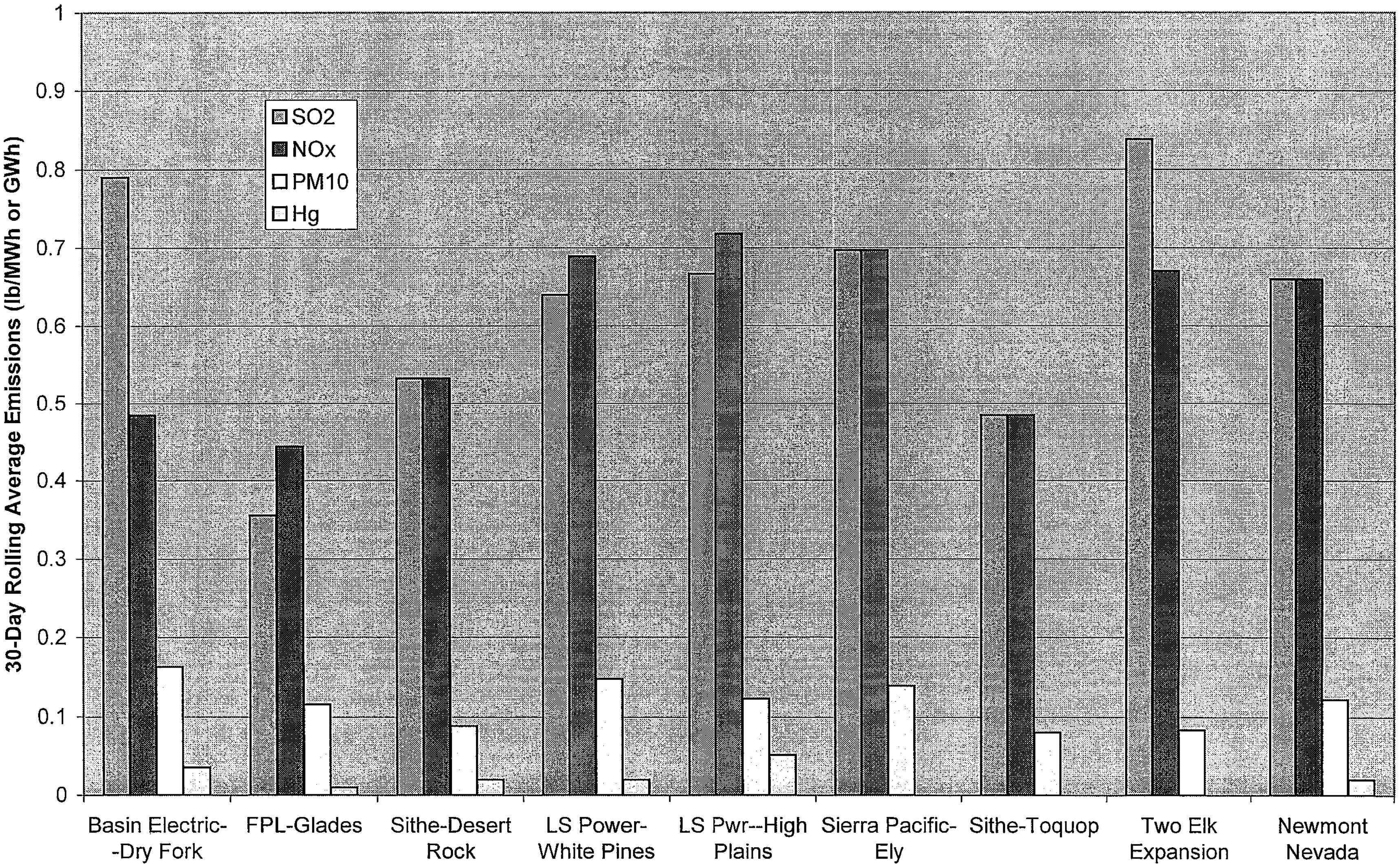

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Table 1.a. SO2 Rankings (1- & 3-hr averaging periods)

SO2			Coal Quality			Capacity			Proposed Limits			Period	Control	
Facility Name	Status	Permit #	%S	(Btu/lb)	(lb/mmBtu)	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(%)
LS Power-White Pines	draft permit	NV	0.45	8200	**0.960**	3x530	1590	15648	0.089	1386	0.87	3	SDA	**90.8%**
Basin Electric--Dry Fork	draft permit	WY	0.47	7800	**1.054**	385	385	3801	**0.100**	380	0.99	3	SDA	**90.5%**
LS Power-White Pines	draft permit	NV	0.66	8200	**1.409**	3x530	1590	15648	**0.089**	1386	0.87	3	SDA	93.7%
Sithe-Desert Rock	draft permit	EPA	0.82	8910	**1.611**	1500	1500	13300	**0.092**	1224	0.82	3	WFGD	94.3%
FPL-Glades	application	FL	1.98	12324	**3.053**	2x980	1960	17400	**0.065**	1131	0.58	3	WFGD	97.9%

Table 1.b. SO2 Rankings (24-hr averaging period)

SO2			Coal Quality			Capacity			Proposed Limits			Period	Control	
Facility Name	Status	Permit #	%S	(Btu/lb)	(lb/mmBtu)	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(%)
Newmont Nevada	issued	NV-0036	0.45	8400	**0.938**	200	200	2030	0.065	132	0.66	24	LSD	**93.1%**
LS Power-White Pines	draft permit	NV	0.45	8200	**0.960**	3x530	1590	15648	0.065	1017	0.64	24	SDA	**93.2%**
LS Pwr--High Plains	application	CO	0.46	8200	**0.982**	600	600	6155	0.065	400	0.67	24	SDA	**93.4%**
Basin Electric--Dry Fork	draft permit	WY	0.47	7800	**1.054**	385	385	3801	**0.100**	380	0.99	24	SDA	**90.5%**
LS Power-White Pines	draft permit	NV	0.66	8200	**1.409**	3x530	1590	15648	**0.090**	1408	0.89	24	SDA	93.6%
LS Pwr--High Plains	application	CO	0.66	8200	**1.409**	600	600	6155	**0.090**	554	0.92	24	SDA	93.6%
Sithe-Desert Rock	draft permit	EPA	0.82	8910	**1.611**	1500	1500	13300	**0.060**	798	0.53	24	WFGD	96.3%
Sierra Pacific-Ely	application	NV	0.8	8100	**1.728**	2x750	1500	17420	**0.060**	1045	0.70	24	LSD	96.5%
FPL-Glades	application	FL	1.98	12324	**3.053**	2x980	1960	17400	**0.040**	696	0.36	24	WFGD	98.7%

Table 1.c. SO2 Rankings (30-day averaging period)

SO2			Coal Quality			Capacity			Proposed Limits			Period	Control	
Facility Name	Status	Permit #	%S	(Btu/lb)	(lb/mmBtu)	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(%)
Newmont Nevada	issued	NV-0036	0.45	8400	**0.938**	200	200	2030	0.065	132	0.66	720	LSD	**93.1%**
LS Power-White Pines	draft permit	NV	0.45	8200	**0.960**	3x530	1590	15648	0.065	1017	0.64	720	SDA	**93.2%**
LS Pwr--High Plains	application	CO	0.46	8200	**0.982**	600	600	6155	0.065	400	0.67	720	SDA	**93.4%**
Basin Electric--Dry Fork	draft permit	WY	0.47	7800	**1.054**	385	385	3801	**0.080**	304	0.79	720	SDA	**92.4%**
Sithe-Desert Rock	pending	EPA	0.82	8910	**1.611**	1500	1500	13300	**0.060**	798	0.53	720	WFGD	96.3%
Sierra Pacific-Ely	application	NV	0.8	8100	**1.728**	2x750	1500	17420	**0.060**	1045	0.70	720	LSD	96.5%
FPL-Glades	application	FL	1.98	12324	**3.053**	2x980	1960	17400	**0.040**	696	0.36	720	WFGD	98.7%

Table 1.d. SO2 Rankings (Annual averaging period)

SO2			Coal Quality			Capacity			Proposed Limits			Period	Control	
Facility Name	Status	Permit #	%S	(Btu/lb)	(lb/mmBtu)	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(%)
Newmont Nevada	issued	NV-0036	0.45	8400	**0.938**	200	200	2030	0.065	132	0.66	8760	LSD	**93.1%**
LS Power-White Pines	draft permit	NV	0.45	8200	**0.960**	3x530	1590	15648	0.065	1017	0.64	8760	SDA	**93.2%**
LS Pwr--High Plains	application	CO	0.46	8200	**0.982**	600	600	6155	0.065	400	0.67	8760	SDA	**93.4%**
Basin Electric--Dry Fork	draft permit	WY	0.47	7800	**1.054**	385	385	3801	**0.080**	304	0.79	8760	SDA	**92.4%**
Sithe-Desert Rock	pending	EPA	0.82	8910	**1.611**	1500	1500	13300	**0.056**	757	0.50	8760	WFGD	96.5%
Sierra Pacific-Ely	application	NV	0.8	8100	**1.728**	2x750	1500	17420	**0.060**	1045	0.70	8760	LSD	96.5%
FPL-Glades	application	FL	1.98	12324	**3.053**	2x980	1960	17400	**0.040**	696	0.36	8760	WFGD	98.7%

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Table 2.a. NOx Rankings (1, 3 & 24-hr averaging periods)

NOx			Issue/Op	Capacity			Proposed Limits			Period	Control	
Facility Name	Status	Permit #	Date	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(%)
FPL-Glades	application	FL		2x980	1960	17400	0.050	847	0.43	24	SCR	87.7%
LG&E-Trimble County	application	KY		750		6942	0.050	348	0.46	24	SCR	86.1%
Mustang	application	NM		300	300	3192	0.060	192	0.64	24	SCR	89.6%
Sithe-Desert Rock	application	EPA		2x750	1500	13300	0.060	798	0.53	24	SCR	85.2%
Sithe-Toquop	application	NV		750	750	6048	0.060	363	0.48	24	SCR	0.86
Sithe-Desert Rock	application	EPA		2x750	1500	13300	0.061	816	0.54	3	SCR	84.8%
Basin Elec--Dry Fork	application	WY		385	385	3801	0.070	266	0.69	24	LNB/SCR	89.1%

Table 2.b. NOx Rankings (720-hr averaging periods)

NOx			Issue/Op	Capacity			Proposed Limits			Period	Control	
Facility Name	Status	Permit #	Date	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(%)
Mustang	application	NM		300	300	3192	0.010	32	0.11	720	Airborne	98.3%
Black Hills Pwr-WYGEN 3	issued	WY	2/5/2007	100		1300	0.050	65	0.65	720	LNB/SCR	89.3%
FPL-Glades	application	FL		2x980	1960	17400	0.050	870	0.44	720	SCR	87.7%
Basin Elec--Dry Fork	draft permit	WY		385	385	3801	0.050	190	0.49	720	LNB/SCR	89.1%

Table 2.c. NOx Rankings (8760-hr averaging periods)

NOx			Issue/Op	Capacity			Proposed Limits			Period	Control	
Facility Name	Status	Permit #	Date	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(%)
Mustang	application	NM		300	300	3192	0.010	32	0.11	9760	Airborne	98.3%
Black Hills Pwr-WYGEN 3	issued	WY	2/5/2007	100		1300	0.050	65	0.65	8760	LNB/SCR	89.3%
FPL-Glades	application	FL		2x980	1960	17400	0.050	870	0.44	8760	SCR	88%
Basin Elec--Dry Fork	draft permit	WY		385	385	3801	0.050	190	0.49	8760	LNB/SCR	89.4%

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Table 3. PM10 Rankings

PM10						Emission Limits						
			Capacity			Filterable			Period	Control	Total	
Facility Name/Location	Status	Permit #	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(lb/mmBtu)	(lb/hr)
Sithe-Toquop	application	NV	750	750	6048	0.010	60	0.08		FF	0.020	121
Sithe-Desert Rock	application	NEPA	750	1500	13600	0.010	136	0.09	3	FF	0.020	272.0
Two Elk Expansion	application	WY	750	750	6285	0.010	63	0.08		FF		
AES--Colorado	application	CO	640	640	5624	0.012	67	0.11	3	FF	0.020	114.0
Basin Electric--Dry Fork	draft permit	WY	385	385	3801	0.012	46	0.12	3	FF		

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Table 4. H2SO4

H2SO4			Issue	Capacity			Emission Limits			Period	Control	
Facility Name/Location	Status	Permit #	Date	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/hr)	(lb/MW)	(hr)	Type	(%)
Newmont Nevada	issued	NV	5/5/2005	200	200	2030	0.0010	2.1	0.010	24	SDA	
Cash Creek	application	KY		2x500	1000	9652	0.00133	12.8	0.013	720	WLS	
Basin Electric--Dry Fork	draft permit	WY		385	385	3801	0.0025	9.5	0.025	720	SDA	

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Table 5. Hg

Hg			Issue	Capacity			Emission Limits			Period	Control	
Facility Name/Location	Status	Permit #	Date	MW	Total	(mmBtu/hr)	(lb/mmBtu)	(lb/MW)	(lb/yr)	(hr)	Type	(%)
Longview Power	issued	WV	3/1/2004	600	600	6114	2.4E-06	2.4E-06	128	3		
FPL-Glades	application	FL		2x980	1960	17400	1.1E-06	9.9E-06	170		PAC	
Newmont Nevada	issued	NV	5/5/2005	200	200	2030	2.0E-06	2.0E-05	35		PAC	
Sithe-Desert Rock	application	EPA		750	1500	13300	2.3E-06	2.0E-05	263			
LS Power-White Pines	draft permit	NV		3x530	1590	15648	2.0E-06	2.0E-05	279			
LS Pwr--High Plains	application	CO		600	600	6155	5.1E-06	5.2E-05	273			
Basin Electric--Dry Fork	draft permit	WY		385	385	3801	9.8E-06	9.7.E-05	327	8760	PAC	

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