PACIFICORP ENERGY
A DIVISION OF PACIFICORP

William Lawson
Director, Environmental Department
1407 West North Temple, Suite 330
Salt Lake City, Utah 84116
801.220.4581 (Office)
801.220.2094 (Fax)

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Mr. David Finley
Wyoming Division of Air Quality
Herschler Building
122 W. 25th Street
Cheyenne, Wyoming 82002

Re: PacifiCorp -- Wyoming BART Determinations and Regional Haze SIP

Dear Mr. Finley,

You have requested that PacifiCorp provide additional support regarding its proposed BART determinations for NO_x emissions at Jim Bridger units 1 – 4 and Naughton unit 3.[1] The information contained in this letter is intended to elaborate on PacifiCorp's BART analyses, which already have been filed with WDAQ for these units.

I. Executive Summary

This letter focuses solely on the proper BART emission limit for NO_x at Naughton unit 3 and the Jim Bridger units. PacifiCorp's individual BART applications for each of these units contain a proposed BART emission limit which can be achieved through the installation of combustion controls such as low-NO_x burners (LNB) and overfire air (OFA). This is appropriate and consistent with the guidance and requirements set forth in "Appendix Y" of EPA's Regional Haze Regulations and Guidelines for Best Available Retrofit Technology; Final Rule ("Regional Haze Rules"), as those are incorporated into Wyoming's state regulations. This is also consistent with the preamble which accompanies Appendix Y and the Regional Haze Rules (the "Preamble"). *See* 70 FR 39104.

Appendix Y references "presumptive BART" emission rates which vary based on boiler design and coal type. To the extent the presumptive BART NO_x emission rates are relevant to Naughton unit 3 and the Jim Bridger units, it is important to note that the coal burned at these units is more comparable to bituminous than subbituminous (as the coal classification relates to NO_x emissions). Correctly assuming that these units burn coal

[1] This letter does not address any of the other PacifiCorp BART-eligible units in Wyoming nor is it intended as a comprehensive list of comments PacifiCorp may choose to make in regard to WDAQ's upcoming BART determinations for the PacifiCorp units.

with bituminous-like NO_x emissions leads to a presumptive BART emission limit for NO_x of 0.28 lb/MMBtu. This presumptive BART emission limit, however, is not the end of the analysis for any of the units, but only serves as a guide against which the calculated BART emission limit can be compared.

Based on a variety of other factors as described herein and in the underlying BART applications, PacifiCorp continues to recommend that assigning a calculated 30-day rolling average BART emission limit for NO_x of 0.26 lb/MMBtu for the Jim Bridger units is appropriate, including the installation of LNB and OFA as the proper BART control technology. Also, assigning a calculated 30-day rolling average BART emission limit for NO_x of 0.35 lb/MMBtu for Naughton unit 3 likewise is appropriate, including the installation of LNB and OFA as the proper BART control technology.

II. Background

In its BART applications for each unit covered by this letter, PacifiCorp and its consultant worked closely with WDAQ staff before submitting detailed BART engineering analyses for Naughton unit 3 and the Jim Bridger units. These analyses resulted in the proposed BART NO_x emission limits and control technologies listed below in Table 1:

Table 1

Unit	Proposed Rate	Proposed Control Technology
Naughton 3	0.35 lb/MMBtu	tune existing LNB and over-fire air system
Jim Bridger 1	0.26 lb/MMBtu	add LNB with separated over-fire air
Jim Bridger 2	0.26 lb/MMBtu	already added LNB with separated over-fire air
Jim Bridger 3	0.26 lb/MMBtu	add LNB with separated over-fire air
Jim Bridger 4	0.26 lb/MMBtu	add LNB with separated over-fire air

In lieu of the above proposed rates, some may argue that WDAQ should instead impose the presumptive BART rate (found in Appendix Y) for tangentially-fired boilers burning subbituminous coal. This rate is 0.15 lb/MMBtu. To the extent this presumptive BART rate is applied, some may argue further that WDAQ should require the installation of SCR as the appropriate BART control technology in order to achieve this NO_x emissions rate. As explained below, however, neither the facts nor the applicable BART requirements support these arguments.

To the contrary, as noted in PacifiCorp's BART applications, and as further explained herein: (i) applying the presumptive BART rate of 0.15 lb/MMBtu for subbituminous coal at these units is not appropriate; and (ii) requiring the installation of SCR at these units likewise is not an appropriate BART control technology.

III. Based on Proper Coal Classification, the "Presumptive" BART NO_x Limit for Naughton Unit 3 and the Jim Bridger Units is 0.28 lb/MMBtu

As explained herein and in the BART applications, to the extent a presumptive BART emission limit (as found in Appendix Y) is relevant, then the appropriate presumptive BART limit for NO_x at Naughton unit 3 and the Jim Bridger units is 0.28 lb/MMBtu.

Presumptive BART

The Preamble to the BART rules observes that "States, as a general matter, must require owners and operators of greater than 750 MW power plants to meet [presumptive] BART limits."[2] 70 FR 39104, 39131. The Preamble goes on to say, however that "a State may establish different requirements if the State can demonstrate that an alternative determination is justified based on consideration of the five statutory factors." *Id.* Specific to NO_x emission limits, the Preamble notes that, "the NO_x limits set forth here today are presumptions only; in making a BART determination, States have the ability to consider the specific characteristics of the source at issue and to find that the presumptive limits would not be appropriate for that source." Id at 39134.

By rule, Wyoming follows Appendix Y in determining the proper BART NO_x emission limits for electric generating units (EGUs). Wyo. Reg., Chap. 6, Sec. 9(c). The presumptive BART NO_x emission limits listed in Appendix Y are "differentiated by boiler design and type of coal burned." *See* 40 CFR Part 51, Appendix Y, IV.E.5. As noted above, the presumptive BART NO_x emission limit (for EGUs with tangentially fired boilers) is 0.15 lb/MMBtu for coal ranked as subbituminous. For coal ranked as bituminous, the presumptive BART NOx emission limit (for EGUs with tangentially fired boilers) is 0.28 lb/MMBtu.[3] *Id.* EPA readily acknowledges that these presumptive NO_x emission limits are based on many assumptions and also that, if one of these assumptions does not apply to a particular unit, it may affect the cost-effectiveness of the presumptive limit.[4]

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[2] The Jim Bridger power plant exceeds 750 MW in total capacity; the Naughton power plant does not.

[3] Even though the Wyoming rules distinguish – based on the amount of generating capacity – between whether Appendix Y "shall" apply or be used merely as "guidance," Appendix Y itself applies the same presumptive NO_x emission limit regardless of facility generating size. "For coal-fired EGUs greater than 200 MW located at greater than 750 MW power plants and operating without post combustion controls [i.e., Jim Bridger units]. . . , we have provided presumptive NO_x limits differentiated by boiler design and type of coal burned . . . . For coal-fired EGUs greater than 200 MW located at power plants 750 MW or less in size and operating without post-combustion controls [i.e., Naughton unit 3], you should likewise assume that these same levels are cost effective. You should require such utility boilers to meet the following NO_x limits, unless you determine that an alternative control limit is justified . . . ." 70 FR 39171.

[4] "The following NO_x emission rates were determined based on a number of assumptions, including that the EGU boiler has enough volume to allow for installation and effective operation of separated overfire air ports. For boilers where these assumptions are incorrect, these emission limits may not be cost-effective." 70 FR 39171.

Coal Classification

Given the large disparity between the presumptive NO_x emission limits for subbituminous and bituminous coals, it is very important to assign the proper coal classification when considering an individual unit. This is particularly true where, as is the case with Naughton unit 3 and the Jim Bridger units, the use of one coal quality classification results in a significantly different presumptive BART rate as compared to another coal classification.

In the Preamble, EPA recognized "that, unlike the methods for controlling SO_2 (which fall within a fairly narrow range of cost effectiveness and control efficiencies), the removal efficiencies and costs associated with the control techniques for NO_x vary considerably, depending on the design of the boiler and the type of coal used." 70 FR 39104, 39134. Also, in that same section of the preamble, EPA recognized that "both cost effectiveness and post-control rates for NO_x do depend largely on boiler design and type of coal burned." *Id.* Therefore, to the extent presumptive BART rates are relevant; the BART analysis for Naughton unit 3 and the Jim Bridger units should carefully consider "the type of coal burned."

Unfortunately, neither Appendix Y, the Preamble, nor the Regional Haze Rules provide a standard or guidance to determine the appropriate coal classification. Instead, Appendix Y simply presumes that coal types are easily classified with a clear distinction between the various coals. This presumption, however, is not correct and certainly should not be the sole basis for assuming that the presumptive NO_x emission rate of 0.15 lb/MMBtu is applicable to Naughton unit 3 and the Jim Bridger units. Indeed, a review of the literature shows that coal types are only loosely defined along a sliding scale, meaning that no bright line distinction between types of coal exists.

Because coal classification is of such fundamental importance in selecting the proper presumptive BART rate, PacifiCorp included in its BART applications an explanation of why the coal burned at Naughton unit 3 and the Jim Bridger units should be considered to be bituminous for the purpose of considering presumptive BART limits for NO_x. In addition, PacifiCorp has attached to this letter a technical memorandum prepared by CH2M Hill entitled "Coal Quality and Nitrogen Oxide Formation" (the "Coal Quality Technical Memo"), which discusses this coal classification issue in more detail. The attached memorandum is intended to amplify similar information provided in the BART applications for these units.

Jim Bridger Units/Naughton Unit 3 Coal Classification

As the Coal Quality Technical Memo explains, a detailed analysis of the key coal characteristics that relate to the formation of NO_x emissions supports the conclusion that

the Jim Bridger units and Naughton unit 3 coals should be considered as bituminous for the purpose of applying a presumptive BART NO_x emission limit. This conclusion alone supports presumptive BART limits based on bituminous coal.

As an additional reason, and as explained in the Coal Quality Technical Memo, most coals from the Powder River Basin ("PRB") are classified as subbituminous C and demonstrate high-reactivity and low-NO_x production characteristics. It is against this backdrop of already low NO_x emissions typically associated with PRB subbituminous coal that EPA selected the very low presumptive NOx emission rate of 0.15 lb/MMBtu for tangentially fired boilers (like those at Naughton unit 3 and the Jim Bridger units) and assumed that this rate could be achieved by combustion controls like LNB and OFA. In reaching this conclusion, however, EPA assumed that PRB subbituminous C coals to represent the entire class of subbituminous coals in use across the country since the PRB coals make up the largest share of such coals. However, there are other types of subbituminous coals that occur outside of the PRB that are not as reactive and low NOx forming as the PRB coals. EPA's general assumptions regarding NO_x emissions and subbituminous coals, therefore, fail to recognize that non-PRB subbituminous coals could have higher NO_x emissions than PRB subbituminous C coals. This, in turn, affects the feasibility and cost effectiveness of the presumptive BART NO_x emission limits (as stated in Appendix Y) for boilers using non-PRB subbituminous coal like Naughton unit 3 and the Jim Bridger units.

In other words, with NO_x emissions from PRB subbituminous coal already low compared to other types of coal, EPA apparently believes it is a technologically easy and cost-effective step to impose an even lower presumptive BART emission rate of 0.15 lb/MMBtu (for tangentially fired boilers), which can be achieved by adding combustion controls like LNB and OFA. However, for non-PRB subbituminous coals, it is not such an easy and cost-effective step because combustion controls typically will not be enough to control NO_x emissions to this rate. In this light, EPA's presumed feasibility and cost-effectiveness falls apart because very expensive and impractical post-combustion controls become part of the BART equation for certain subbituminous (non-PRB) coals.

The Coal Quality Technical Memo concludes as follows:

> "For all these reasons, the [Naughton unit 3 and Jim Bridger units] coals . . . are more similar in their NO_x formation potential to bituminous coals than to subbituminous coals such as PRB. Therefore, the presumptive BART limit that should be considered for the Jim Bridger [units] and Naughton [unit 3] . . . should be closer to 0.28 lb/MMBtu presumptive BART limit rather than the subbituminous 0.15 lb/MMBtu limit."

Considering the presumptive BART NO_x emission limit for bituminous coal for Naughton unit 3 and the Jim Bridger units not only complies with the requirements of

Wyoming law (including Appendix Y), but is more stringent than BART limits imposed on other Wyoming sources.[5]

Coal Classification In Other States

The coal classification issue discussed above in regard to presumptive BART limits is not unique to PacifiCorp's units or the state of Wyoming. The State of New Mexico is addressing a similar issue concerning the San Juan Generating Station (SJGS).

In New Mexico, the SJGS argues that it cannot meet the presumptive BART NO_x emissions limit of 0.23 lb/MMBtu (for a dry bottom, wall-fired boiler) for subbituminous coal. Using this presumptive BART limit was problematic because the local New Mexico coal used by SJGS fit into a "gray area" between bituminous and sub-bituminous coal. *See* "Discussion of SJGS Coal Ranking for BART NO_x Presumptive Limit Determination." The SJGS coal was less volatile, and has less oxygen and moisture, than the characteristics of PRB subbituminous coals used in developing the presumptive BART NO_x emission limits under Appendix Y. *Id.* As the SJGS explains, "with respect to NO_x combustion control performance, SJGS coal behaves more like a bituminous coal."[6] *Id.*

The same can be said of the Jim Bridger units and Naughton unit 3 coals. Therefore, if a presumptive NO_x emissions limit is considered for any of these units, PacifiCorp urges WDAQ to take account of the applicable coal characteristics and properly assume that the Jim Bridger units and Naughton unit 3 coals are closer to bituminous in composition than subbituminous. This proper assumption, in turn, leads to the conclusion that if a presumptive BART NO_x emission limit is considered for any of these units, it should be at the 0.28 lb/MMBtu rate presumed for bituminous coal. As explained in the following section, however, the calculated BART emission rates noted in Table I above should control over the presumptive BART rates in any event.

IV. The Five Factor Analysis Also Indicates SCR Is Not Appropriate

[5] For example, Wyoming has proposed higher NO_x emissions rates for other coal fired boilers in Wyoming. When making the BART determination for FMC's Westvaco facility, Wyoming determined that a NO_x emissions rate of 0.35 lb/MBTU was BART. *See* August 4, 2008 BART Application Analysis, AP 6045, pg. 30. Additionally, Wyoming approved a BART NO_x emissions rate of 0.49 lb/MBTU for General Chemical's two coal fired boilers at its Green River Works facility. *See* August 4, 2008 BART Application Analysis, AP 6046, pg. 26. PacifiCorp's proposed "presumptive" BART limit of 0.28 lb/MBTU for the Naughton and Jim Bridger power plants is much lower than these sources.

[6] The BART NO_x emission limit proposed by the New Mexico Environment Department for the SJGS is 0.293 lb/MMBtu. This is consistent with the limit established in a consent decree concerning the plant which is unrelated to the BART determination. For information concerning SJGS BART issues, see http://www.nmenv.state.nm.us/aqb/reghaz/documents/COMPLETEFinalDiscussionofSJGSCoalClassificationRevisi.pdf

Establishing the appropriate presumptive BART NO_x emission limit as described above is only one consideration in making a proper BART determination. Indeed, if an analysis of the five statutory factors supports a different emissions limit, then the presumptive BART rates take on a role only as a non-binding guide or marker for units like Naughton unit 3 and the Jim Bridger units.

Five Factor Analysis and Proposed BART Limits

As noted, the presumptive BART limits are exactly what they purport to be – presumptions that can be rebutted and modified based on additional case by case information. In the Preamble, EPA states that its "presumption accordingly may not be appropriate for all sources. As noted, the NO_x limits set forth here today are presumptions only; in making a BART determination, States have the ability to consider the specific characteristics of the source at issue and to find that the presumptive limits would not be appropriate for that source." 70 FR 39134. Appendix Y further explains that a state "may determine that an alternative control level is appropriate based on a careful consideration of the [five] statutory factors," particularly for boilers where EPA's assumptions related to NO_x emissions rates are incorrect. *See* Appendix Y, IV.E.5.

PacifiCorp already has submitted a detailed five factor analysis for Naughton unit 3 and the Jim Bridger units in their individual BART applications. The final result of this analysis is a proposed BART emission limit for NOx at Naughton unit 3 of 0.35 lb/MMBtu – higher than the presumptive BART limit of 0.28 lb/MMBtu. As for the Jim Bridger units, the result of the analysis is a NOx limit of 0.26 lb/MMBtu – lower than the presumptive BART limit. In each case; however, the proposed BART limits can be met by the installation of combustion controls. Imposing lower NO_x limits than PacifiCorp has proposed would require the installation of post-combustion controls such as SCR, which is contrary to applicable BART requirements because the "cost of compliance" would be too high.

Cost of Compliance

Focusing on the cost of compliance factor, EPA assumes in the Preamble that approximately 75% of the EGUs would have BART NO_x removal costs between $100 and $1,000 per ton, and that almost all of the remaining EGUs could install sufficient combustion control technology for less than $1,500 per ton:

> "The limits provided were chosen at levels that approximately 75 percent of the units could achieve with current combustion control technology. The costs of such controls in most cases range from just over $100 to $1000 per ton. Based on our analysis, however, we concluded that approximately 25 percent of the units could not meet these limits with current combustion control technology. However, our analysis indicates that all but a very few of these units could meet the presumptive limits using advanced combustion controls such as rotating opposed fire air

> ("ROFA"), which has already been demonstrated on a variety of coal-fired units.[7] Based on the data before us, the costs of such controls in most cases are less than $1500 per ton." 70 FR 39135.

EPA's assumptions regarding the cost of controls place Naughton unit 3 or the Jim Bridger units outside the scope of expected removal costs when considering the lower presumptive limit of 0.15 lb/MMBtu. As indicated in the BART applications, these units can only meet this rate by installing SCR. Under this scenario, the incremental control costs per ton would approach $4,000 per ton, well above the presumed control cost range included in the Preamble.

It is for this reason that EPA stated further in the Preamble that SCR generally is not cost effective for EGUs (except for cyclone boilers):

> "We also analyzed the installation of SCRs at BART-eligible EGUs, applying SCR to each unit and fuel type. The cost-effectiveness was generally higher than for current combustion control technology except for one unit type, cyclone units. Because of the relatively high NO_x emission rates of cyclone units, SCR is more cost-effective. Our analysis indicated that the cost-effectiveness of applying SCR on coal-fired cyclone units is typically less than $1500 a ton, and that the average cost-effectiveness is $900 per ton. As a result, we are establishing a presumptive NO_x limit for cyclone units based on the use of SCR. For other units, we are not establishing presumptive limits based on the installation of SCR. Although States may in specific cases find that the use of SCR is appropriate, *we have not determined that SCR is generally cost-effective for BART across unit types*." 70 FR 39135-36. (Emphasis supplied)

V. LNB /OFA Are the Proper BART Control Technology; SCR is Not

Unlike SCR, LNB/OFA is the proper BART control technology for Naughton unit 3 and the Jim Bridger units.

A "BART" determination involves not only the setting of an emissions limit, but also the selection of a particular emissions control technology, or group of technologies, to achieve that limit. Wyoming's BART rules refer to this as "control equipment", "control technology", and "BART technology." Wyo. Reg., Chp. 6, Sec. 9(e)(i)(E), Sec. 9(e)(iii) and (e)(viii). Regardless of the term used, and as explained above, the Preamble and other guidance are clear that LNBs and OFA are intended to be the "BART technology" for the tangentially fired boilers such as Naughton unit 3, the Jim Bridger units, and other similarly situated units.

[7] The BART applications for Naughton unit 3 and the Jim Bridger units explain why ROFA is not a workable alternative for those units.

In the Preamble, EPA stated that, except for cyclone boilers, the "types of current combustion control technology options assumed include low NOx burners, over-fire air, and coal reburning." 70 FR 39134; *see also* 39144 ("For all other coal-fired units, our analysis assumed these units will install current combustion control technology."). In fact, in the Technical Support Document used to develop the presumptive BART NO_x emissions limits, EPA explained that the "methodology EPA used in applying current combustion control technology to BART-eligible EGUs" included applying "a complete set of combustion controls. A complete set of combustion controls for most units includes a low NO_x burner and over-fire air." See, "Technical Support Document, Methodology for Developing NO_x Presumptive Limits," EPA Clean Air Markets Division, pg. 1 (dated June 15, 2005).

The Preamble identifies post-combustion controls for NO_x, such as SCR and SNCR, as "BART technology" for only "cyclone" units. EPA made it clear that for "other units, we are not establishing presumptive limits based on the installation of SCR." 70 FR 39136. Therefore, EPA's presumptive "BART technology" is LNBs and some type of OFA. EPA further elaborated in the preamble on the SCR costs, stating that although "States may in specific cases find that the use of SCR is appropriate, we have not determined that SCR is generally cost-effective for BART across unit types." *Id.*

Other BART eligible sources in Wyoming have determined that LNBs and/or OFA are "BART technology," and that SCR would not be appropriate. For example, after additional analysis and study, Basin Electric recently submitted its analysis that OFA was the appropriate BART technology for the Laramie River Station and that SCRs were not "BART" due to several factors, including the high cost and relatively low visibility improvement. *See* Basin Electric/Laramie River Station Refined BART Visibility Modeling, pages 13 and 14 (submitted July 24, 2008).

Similarly, the State of Wyoming also determined that LNBs and OFA were BART for the coal-fueled boilers at FMC's Westvaco facility and at General Chemical's Green River Works facility. *See* August 4, 2008 BART Application Analysis, AP 6045, pg. 30, and August 4, 2008 BART Application Analysis, AP 6046, pg. 26. All of these BART analyses reviewed SCR and SNCR, but none of them found that SNCR or SCR are BART for any of these facilities. Likewise, LNBs and OFA should be determined to be BART technology for PacifiCorp's Jim Bridger and Naughton EGUs.

A recent survey of the western states indicates that no states have mandated SCR or SNCR as "BART technology" for any EGUs. For example, in Colorado's recent BART determinations, Colorado recognized LNBs and OFA (or some modification of the same) as BART for 14 different EGUs. *See* Colorado's Air Quality Regulations, Part F, IV.D. In fact, consistent with PacifiCorp's position explained above, Colorado believes that Appendix Y and the preamble do not allow post-combustion control, such as SCRs, to be considered at all as "BART technology." In a letter addressing BART issues, Colorado's Air Quality Division explained that "Colorado's BART rule does not allow for post combustion NOx controls. This provision is based upon the preamble to the final EPA

BART rule and Appendix Y." *See* January 11, 2008 letter to Vickie Patton from Colorado Division of Air Quality, pg. 3.

Additionally, the Oregon Department of Environmental Quality, in the August 20, 2008, BART determination for the Boardman power plant, found that SCR was not BART technology and stated that the "capital cost of [SCR] is 7 times that of new low NOx burners with modified overfire air system." PacifiCorp's BART applications confirm that SCR is not cost-effective or otherwise appropriate for Naughton unit 3 or the Jim Bridger units. Therefore, Wyoming, like other western states that have considered the issue, should determine that BART technology for PacifiCorp's Jim Bridger and Naughton power plants is LNBs and OFA, and not SCR or SNCR.

VI. Conclusion

Based on a close examination of the characteristics of coal burned Naughton unit 3 and the Bridger units, it is clear that the appropriate presumptive BART NO_x emission rate for consideration at these units is 0.28 lb/MMBtu. The appropriate calculated NO_x emission rate, however, is 0.35 lb/MMBtu for Naughton unit 3 (30 day rolling average) and 0.26 lb/MMBtu for the Bridger units (30 day rolling average). The appropriate control technology to achieve these rates is LNB and OFA.

Please feel free to contact us with any questions.

Sincerely,

William K. Lawson
Director, Environmental Services

cc: Idaho Power