BEST AVAILABLE RETROFIT TECHNOLOGY
AT EGU FACILITIES

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Statement of Purpose

This document provides the draft findings for external review of implementing Best Available Retrofit Technology (BART) requirements for electric generating utility (EGU) sources in Wisconsin. After modeling the potential visibility impairment of BART-eligible sources, the Department finds nine EGU sources subject to BART. Boilers located at these sources are affected under the BART source category of fossil fuel boilers greater the 250 mmbtu/hr. All of the EGUs found subject to BART are also subject to the Clean Air Interstate Rule (CAIR) under 40 CFR part 97, and therefore are not required to conduct a BART analysis for sulfur dioxide (SO_2) and nitrogen oxide (NO_x) emissions. However, these sources are required to conduct a BART analysis for particulate matter (PM).

The Department is proposing BART control of optimization of existing baghouses and electrostatic precipitators at the EGU sources. BART control for baghouses achieves greater than 99% removal efficiency, while BART control for all but one electrostatic precipitator achieves greater than 98% removal efficiency. These proposed source-specific BART requirements are subject to review and comment by Federal Land Managers for the Class I areas, the US EPA, the affected source, and other interested parties. This feedback is used in order to inform the Department's final decision on the BART determination.

Introduction

Under the Clean Air Act, individual states are required to establish a plan and air pollution control program which mitigates current impacts and protects the visibility of certain federal Class I areas. For Wisconsin, the primary Class I areas include Boundary Waters Wilderness Area, Voyageurs National Park, Seney National Wildlife Refuge, and Isle Royal National Park (Appendix A). These visibility pollutant control programs are also frequently referred to as regional haze requirements or regional haze control programs. The pollutants emitted by Wisconsin stationary sources having the greatest impact on Class I area visibility are particulate matter (PM) and gaseous pollutants including sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) that transform or react into small particles in the atmosphere. Other air pollutants including ammonia and volatile organic compounds take part in formation of small particles, but their emission levels from these sources is proportionally much lower and less important to haze formation.

A core federal requirement for addressing visibility impairment at the federal Class I areas is the implementation of a control program for certain stationary sources known as Best Available Retrofit Technology (BART). This BART control requirement addresses older sources that do not have air pollution control equipment and which are shown to directly affect visibility at the Class I areas. The federal requirements for identifying sources subject to BART, and the methods for determining appropriate emission control requirements, are set forth by the US EPA under 40 CFR Part 51, Appendix Y, *Guidelines for BART Determinations Under the Regional Haze Rule*.

In January 2008, the state adopted rules under ch. NR 433, Wis. Adm. Code, in order to meet the federal BART requirements. The state rule establishes a process for sources subject to BART to submit an analysis of potential pollution control technologies and their installation cost and issues. This analysis supports the Department in making a determination of BART control requirements specific to the facility. Sources must implement BART requirements by December 31, 2013. The Department is currently proposing a rule modification to extend the compliance date to December 31, 2015. The purpose of the modification is to allow for more complex installations of pollution control equipment that would enable enhanced emission reductions.

<u>Identified BART-eligible sources</u>

The Department identified 12 Wisconsin EGU sources as BART-eligible, listed in Table 1. BART-eligible sources include those sources that meet all of the criteria (listed below) as set by the Clean Air Act. These criteria are intended to identify older emission sources which likely do not have pollutant control systems and which also have a substantial remaining operating life. The criteria also identify sources which emit pollutants in quantities that may negatively affect visibility. These BART-eligible sources identify a core set of stationary sources which each state must address as a first step in any plan for regional haze and visibility protection. The BART requirement is not intended to be exhaustive of stationary sources that warrant control for meeting overall haze and visibility requirements.

- The source or emission unit(s) falls within one of 26 source categories (Appendix B).
- The emission unit(s) was installed by August 7, 1977, but not in operation before August 7, 1962.
- The source or emission unit(s) potential to emit for any single visibility-impairing pollutant is greater than 250 tons per year given its physical and operational design, and considering all federally enforceable and State enforceable permit limits.

Table 1. Wisconsin EGU Sources with BART-eligible Units

BART Source Category	Potential WI BART Facilities	Eligible Emission Units	Emissions (grams/s)			Modeled Visibility Impairment (No. days > 0.5 deciview)
			SO_2	NO_x	PM_{10}	
Fossil-fuel fired steam electric plants of more than 250 million British thermal units (Btu) per hour heat input	Alliant Energy – Columbia	B-01,02	1266.1	710.2	34.4	72
	WP & L Alliant Energy – Edgewater	B-24	423	501	13	49
	Alliant Energy – Nelson Dewey	B-22	478	75	18	15
	Dairyland Power Coop – Alma	B-25	613.2	150.4	5.4	40
	Dairyland Power Coop – Genoa	B-20	2411.2	155.5	18.5	63
	Madison Gas & Electric Company – Blount Street	B-20,21,22,23	23.1	24.5	1.3	0
	Manitowoc Public Utilities	B-27	93.2	32.6	17.5	5
	Wisconsin DOA / UW Madison – Charter Street	B-25	100.2	28.4	18.9	2
	We Energies – Oak Creek	B-27,28	2087.0	182.6	6.5	62
	We Energies – Pleasant Prairie *	B-21,22	-	-	-	-
	We Energies – Valley	B-21,22,23,24	1398.5	445.8	64.0	64
	Wisconsin Public Service Corporation – JP Pulliam Plant	B-27	797.3	247.2	14.1	73

* Pleasant Prairie self-identified as BART-subject.

Sources Subject to BART

The next step in the BART process is to determine which BART-eligible sources cause substantial impairment to visibility at Class I areas. Such a source is subject to BART (BART-affected), and as such must be evaluated for BART control requirements.

The Department used the CALPUFF air quality model to model the source's emissions in order to determine the visibility impairment on a class I area. If the modeled results show a significant reduction in visibility, the source is subject to BART or "BART-affected". Overall, how much a source's emissions impair the visibility of a Class I area is dependent on the type and amount of emissions, the distance to the receptor Class I area, and the prevalent meteorological conditions. Wisconsin stationary sources primarily affect visibility at the following nearby Class I areas: Boundary Waters Wilderness Area, Voyageurs National Park, Seney National Wildlife Refuge, and Isle Royal National Park (Appendix A). Emissions from Wisconsin stationary sources also affect other Class I areas, but modeling indicates the duration and frequency of such visibility impacts are minimal.

The protocol for the CALPUFF modeling and threshold for determining if a source is BART-affected is as follows:

- A source is BART-affected if the modeled reduction in visibility at any individual Class I area based on the facility modeled is greater than 0.5 deciviews (dv) for more than 2% of the year (7 days) as compared to the natural background visibility.
- The amount of emissions modeled is the aggregate of all visibility impacting pollutants (PM_{10}, SO_2, NO_x, Ammonia, VOCs) emitted from all of the BART-eligible emission units at a source. The amount of emissions modeled is the maximum actual daily emission rate based on operations during the calendar years of 2002, 2003, and 2004, if available and approved by the Department, or the source's potential to emit. Since the intent is to quantify the impairment due to the BART-eligible sources, pollutants emitted from any other emission units at the source are not included in the modeling analysis.
- The modeling process measures the reduction in visibility versus the natural background of visibility. This background visibility set in the CALPUFF modeling is by default the average of the natural background visibility during the 20% best visibility days. The LADCO protocol discusses this approach to applying the CALPUFF model in more detail.[1]

Based on these procedures, the Department determined nine EGU sources in Wisconsin to be BART-affected, listed in Table 2.

[1] "Single Source Modeling to Support Regional Haze BART Modeling Protocol." March 21, 2006. Lake Michigan Air Directors Consortium, Des Plaines, IL.

Table 2. Wisconsin EGU Sources with Units Subject to BART.

WI BART Facilities	Emission Units
Alliant Energy – Columbia	B-01,02
Alliant Energy – Nelson Dewey	B-22
WP & L Alliant Energy – Edgewater	B-24
Dairyland Power Coop – Alma	B-25
Dairyland Power Coop – Genoa	B-20
We Energies – Oak Creek	B-27,28
We Energies – Pleasant Prairie	B-21,22
We Energies – Valley	B-21,22,23,24
Wisconsin Public Service Corporation – JP Pulliam	B-27

The CALPUFF modeling showed that the BART-eligible fossil fuel boilers at these facilities, when operating at potential maximum emission levels, could impair visibility in at least one Class I Area by more than 0.5 dv for greater than 7 days in any one year. For each of the other sources listed in Table 1, the modeled visibility impacts do not exceed 0.5 dv for more than 7 days in any one year, and therefore are not BART-affected.

Determination of BART controls

Once a source is subject to BART, the Department must determine the appropriate control requirements for that specific source; i.e. BART controls are determined on a case-by-case basis. To make this determination the state BART rule requires that an affected source submit to the Department an analysis of the applicable pollutant control options and a proposed BART level of control for each visibility-impairing pollutant. The Department is then required to propose a BART level of control and associated compliance requirements. Final BART requirements are determined based on stakeholder and public input, and incorporated into a facility's Title V operating permit.

The determination of BART control requirements for each source is based on five factors:

(1) The costs of compliance.
(2) The energy and non-air environmental impacts.
(3) Any existing pollution control technology in use at the source.
(4) The remaining useful life of the source.
(5) The degree of improvement in visibility which may reasonably be anticipated to result from the use of the technology.

All of the EGUs found subject to BART are also subject to the Clean Air Interstate Rule (CAIR) under 40 CFR part 97, and therefore are not required to conduct a BART analysis for sulfur dioxide (SO_2) and nitrogen oxide (NO_x) emissions. However, these sources are required to conduct a BART analysis for particulate matter (PM).

All of the BART-affected EGUs have high efficiency control equipment (approximately 95% PM control and higher) currently in-use for particulate matter. In cases where emission controls are in place the federal BART program requires that, at a minimum, the BART determination consider the "betterment of existing control equipment". This betterment considers if the equipment is being operated in the best manner possible or if there are modifications that can be made, so as to update the equipment comparable to current installations. In Wisconsin, the only cases requiring a betterment analysis are existing installations of baghouses and electrostatic precipitators (ESP) which are used for controlling particles and meeting opacity requirements.

The Department conducted an analysis of PM reductions at several BART units in the state. These units were equipped with either baghouses or ESPs. The Department assessed the extent of visibility improvement using CALPUFF by reducing currently reported PM emissions from these units (Appendix C). Based on this evaluation, the Department found that the visibility improvement resulting from reduction in PM emissions is not significant. The cost of incremental visibility improvement is also likely to be very high for additional PM control by modifying the existing equipment configuration. For these reasons, the Department determined that sources with high efficiency PM controls such as a baghouse or an ESP meet a BART level of control technology, and proceeded to evaluate the potential for “betterment of control” at each unit.

The Department then allowed BART-affected sources to make an abbreviated PM related BART submittal, if the PM control equipment is intended to continue operating in the future. This submittal included the following items:

- Description of the type of PM control equipment used, along with the range of collection efficiency expected from the properly operated control equipment.
- Installation date of the equipment.
- Answer the question: "Can existing PM control efficiency be improved without modifying the existing equipment configuration?"
- Maintenance procedures for the equipment.
- Description of PM related emission monitoring.
- Estimate of the remaining useful life of the BART unit.

<u>Proposed BART requirements</u>

Each EGU source subject to PM BART submitted an analysis of potential control options for the BART-affected fossil fuel boiler(s) at the facility. These analyses may be found in Appendix E. Based on the submitted analyses, and consideration by the Department of available controls, costs, and visibility impairment in keeping with the *Guidelines*, the Department is proposing BART emission limitations for the boilers at these sources. A summary of this analysis is presented here. The Department's determination of BART for each EGU source is described more fully in Appendix C.

<u>Visibility Improvement</u>

DNR used the changes in visibility impairment for Seney National Wildlife Refuge Class I area, quantified using the CALPUFF model, to evaluate the effectiveness of additional PM controls at the EGUs. DNR used 100% PM_{10} control as an extreme for additional control from the baseline maximum actual or PTE PM_{10} emissions. Additional detailed assumptions and results for BART visibility modeling for the different facilities are found in Appendix C. One basis for measuring visibility impacts is the relative improvement in the maximum day visibility impairment. The other measure of visibility improvement evaluated is the number of days for which a change in visibility due to the BART controls can be quantified. This metric indicates the relative frequency and depth in visibility improvement.

ESPs

After applying additional PM_{10} controls up to 100% at ESPs, the modeled improvement from the baseline maximum visibility impairment is 0.01 dv or less at all but one boiler unit. The modeling result with additional controls at the JP Pulliam boiler unit showed an improvement in the baseline maximum visibility of 0.02 dv. The number of days with a maximum visibility impairment of 0.1 dv or greater had a reduction of only 1 day or less for each boiler unit.

Table 4. Modeled Visibility Improvements Resulting from Additional PM Control for ESPs (2002-2004 baseline)

Boiler Unit	Visibility Impairment based on CALPUFF					Calculated Visibility Improvement	
	2002-2004 Baseline			100% PM_{10} Control on BART Boilers			
	PM_{10} Control Efficiency (%)	Max day dv [a]	Days => 0.1 dv [b]	Max day dv [a]	Days => 0.1 dv [b]	Max day dv improvement	Days => 0.1 dv
Alliant Energy							
Columbia – B21	96.4	2.95	108	2.93	106	2.95-2.93 = <u>0.02</u>	108 - 106 = 2
Columbia – B22	97						
Edgewater – B24 [c]	94.9			2.94	107	2.95-2.94 = <u>0.01</u>	108 - 107 = 1
Nelson Dewey – B22 [c]	95			2.94	107	2.95-2.94 = <u>0.01</u>	108 - 107 = 1
WE Energies							
Oak Creek – B27	99.92	Not modeled				< 0.01 (est.)	< 1 (est.)
Oak Creek – B28	99.77					< 0.01 (est.)	< 1 (est.)
Pleasant Prairie – B21	99.91	Not modeled				< 0.01 (est.)	< 1 (est.)
Pleasant Prairie – B22	99.75					< 0.01 (est.)	< 1 (est.)
Wisconsin Public Service Corporation							
JP Pulliam – B27 [c]	98.9	5.17	153	5.15	152	5.17-5.15 = <u>0.02</u>	153 - 152 = 1

[a] Maximum day visibility impairment measured in deciviews (only calculated at the Seney Class I area).
[b] Number of days with maximum visibility impairment => 0.1 deciviews.
[c] Additional non-BART boiler emissions were included in the modeling, but are assumed to not change the visibility improvement associated with additional PM reductions from the BART boilers.

Baghouses

After applying additional PM_{10} controls up to 100% at baghouses, the modeled improvement from the baseline maximum visibility impairment is 0.01 dv or less for each boiler unit. The number of days with a maximum visibility impairment of 0.1 dv or greater had a reduction of only 1 day or less for each boiler unit.

Table 5. Modeled Visibility Improvement Resulting from Additional PM Control for Baghouses (2002-2004 baseline)

Boiler Unit	Visibility Impairment based on CALPUFF					Estimated Visibility Improvement	
	Baseline			100% PM_{10} Control on BART Boilers			
	PM_{10} Control Efficiency (%)	Max day dv [b]	Days => 0.1 dv [c]	Max day dv [b]	Days => 0.1 dv [c]	Dv improvement	Days => 0.1 dv
Dairyland Power Coop							
Alma Station – B25 [a]	98.36	Not modeled				< 0.01	< 1
Genoa Station – B20 [a]	97.67	Not modeled				< 0.01	0 – 1
We Energies							
Valley Station – B21	99.86	Not modeled				0.01	0 – 1
Valley Station – B22	99.24					0.01	0 – 1
Valley Station – B23	99.94					0.01	0 – 1
Valley Station – B24	99.95					0.01	0 – 1

[a] PM emissions during the 2002-2004 baseline period were controlled using an ESP.
[b] Maximum day visibility impairment measured in deciviews (only calculated at the Seney Class I area).
[c] Number of days with maximum visibility impairment => 0.1 deciviews.

Betterment of Controls

As mentioned above, the BART determination should at least consider the "betterment of existing control equipment" in cases where ESPs or baghouses are in place. In addition to optimizing the equipment operation, there are also modifications which can be made in order to update the equipment. These modifications include upgrades such as flue gas conditioning and improved fabric material, and are described in Appendix C. In general, there are fewer upgrade options for newer control equipment. For additional PM control by modification of the existing equipment configuration, the cost of incremental visibility improvement is likely to be very high, and therefore the Department did not require facilities to evaluate this particular betterment option.

ESPs

Typical new equipment design PM control efficiencies for ESPs are between 99 and 99.9%, while some older ESPs only achieve 90%.[2] All but two of the Wisconsin utility boilers subject to BART and employing ESP control systems have a tested PM control efficiency greater than 99%. The ESP for Alliant Energy – Nelson Dewey boiler B22, which is relatively older compared to ESPs at other EGU facilities, has greater than 98% PM control. The ESP for Alliant Energy – Edgewater B24, which is older than the ESP at Nelson Dewey, has greater than 94% PM control. The specific betterment options evaluated by each facility are described in Appendix C. The Department's analysis of the submittals indicate that the control equipment already achieves a high PM control level, the sources identified appropriate upgrade options, and the sources identified steps already taken to minimize emissions from the ESPs. The Department determined these control measures, along with the existing permit conditions at each facility, to meet BART.

Baghouses

Typical new equipment design PM control efficiencies for baghouses are also between 99 and 99.9%, while older baghouses have a range between 95 and 99.9%.[3] All of the Wisconsin utility boilers subject to BART and employing baghouse control systems have a tested PM control efficiency greater than 99%. The specific betterment options evaluated by each facility with a baghouse are described in Appendix C. The Department's analysis of the submittals indicate that the control equipment already achieves a high PM control level, the sources identified appropriate upgrade options, and the sources identified steps already steps taken to minimize emissions from the baghouses. The Department determined these control measures, along with the existing permit conditions at each facility, to meet BART.

<u>Conclusion and Permit Requirements</u>

For PM emissions, an existing ESP or an existing baghouse controls the flue for each BART-affected boiler. The Department performed CALPUFF modeling using an established baseline to determine visibility impacts for additional PM controls – from above 94% control up to 100% control – on ESPs and baghouses. The modeling demonstrated insignificant continuous visibility improvement. A "betterment of control" analysis was also performed for each facility, which included steps for minimizing PM emissions and possible upgrades for the control equipment. Following the five-factor criteria in the *Guidelines* for evaluating BART, the Department determined BART control for PM to be the existing controls along with the existing permit conditions. These determinations are based primarily on the small continued visibility improvement from increasing PM control efficiency, as well as the options considered for betterment of control. The PM control levels on ESPs and baghouses for these determinations are presented in Tables 6 and 7, respectively.

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[2] "Air Pollution Control Technology Fact Sheet – Dry Electrostatic Precipitator (ESP) – Wire-Plate Type." US EPA. Online. http://www.epa.gov/ttn/catc/dir1/fdespwpl.pdf. June 24, 2010.
[3] "Air Pollution Control Technology Fact Sheet – Fabric Filter – Pulse-Jet Cleaned Type." US EPA. Online. http://www.macrotek.net/pdf/FS_Pulse_Clean_Dust_Collector.pdf. June 24, 2010.

The Department is proposing for public comment the PM related BART permit requirements in Tables 6 and 7, for ESPs and baghouses, respectively. The permit requirements are the existing Title V permit limits for PM. These limits establish *continuous* control, in accordance with the *Guidelines*. Since the Department is not proposing significant changes to the permits, a template for the draft revision of each EGU facility's Title V operating permit, which includes the proposed BART requirements, is presented in Appendix D.

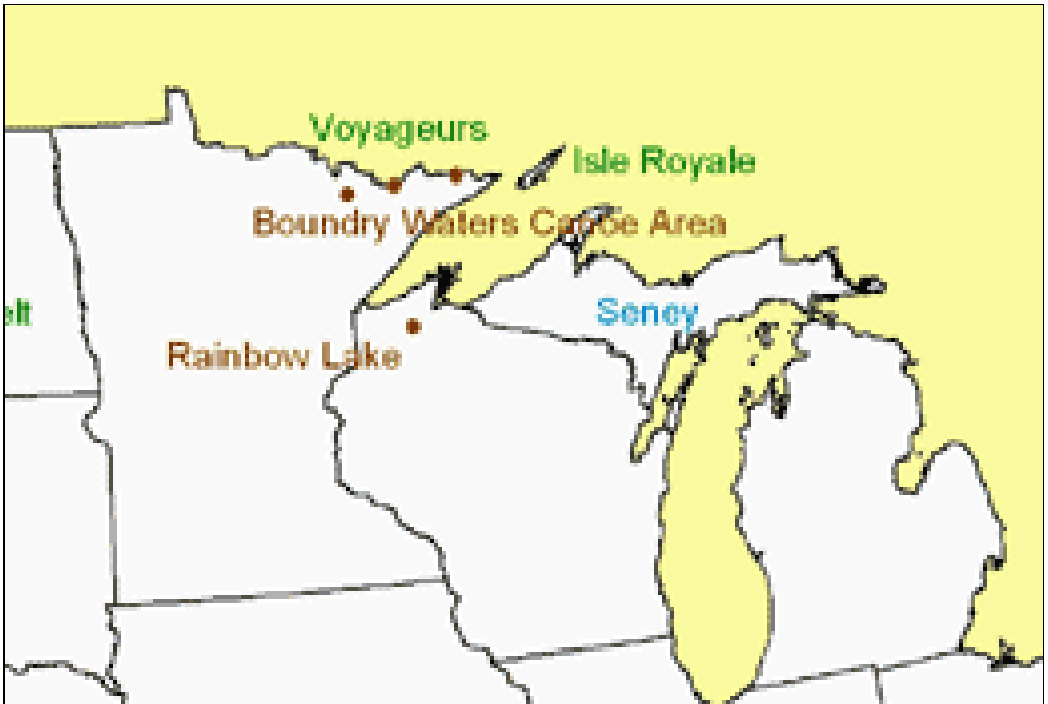
Table 6. Proposed BART Determination for EGU BART Sources with ESP Control

Unit	PM Permit Emission Limit (Lbs/mmBtu)
Columbia – B21	0.60
Columbia – B22	0.10
Edgewater – B24	0.13
Nelson Dewey – B22	0.10
Oak Creek – B27	0.03
Oak Creek – B28	0.03
Pleasant Prairie – B21	0.10
Pleasant Prairie – B22	0.10
JP Pulliam – B27	0.30

Table 7. Proposed BART Determination for EGU BART Sources with Baghouse Control

Unit	PM Permit Emission Limit (Lbs/mmBtu)
Alma Station – B25	0.10
Genoa Station – B20	0.034
Valley Station – B21	0.15
Valley Station – B22	0.15
Valley Station – B23	0.15
Valley Station – B24	0.15

Appendix A. Primary Federal Class I Areas Affected by Wisconsin Stationary Source Emissions



Note: Rainbow Lake is not a listed Class I area under the Regional Haze Rule.

Appendix B. BART-eligible Source Categories

(1) Fossil-fuel fired steam electric plants of more than 250 million British thermal units (BTU) per hour heat input

(2) Coal cleaning plants (thermal dryers)

(3) Kraft pulp mills

(4) Portland cement plants

(5) Primary zinc smelters

(6) Iron and steel mill plants

(7) Primary aluminum ore reduction plants

(8) Primary copper smelters

(9) Municipal incinerators capable of charging more than 250 tons of refuse per day

(10) Hydrofluoric, sulfuric, and nitric acid plants

(11) Petroleum refineries

(12) Lime plants

(13) Phosphate rock processing plants

(14) Coke oven batteries

(15) Sulfur recovery plants

(16) Carbon black plants (furnace process)

(17) Primary lead smelters

(18) Fuel conversion plants

(19) Sintering plants

(20) Secondary metal production facilities

(21) Chemical process plants

(22) Fossil-fuel boilers of more than 250 million BTUs per hour heat input

(23) Petroleum storage and transfer facilities with a capacity exceeding 300,000 barrels

(24) Taconite ore processing facilities

(25) Glass fiber processing plants

(26) Charcoal production facilities

Appendix C. BART Determinations for EGU Facilities

The Department determined that several fossil-fuel boilers at different facilities in Wisconsin are subject to BART for particulate matter (PM). Pursuant to this determination, each EGU facility submitted a PM BART analysis as required under s. NR 433.04. These analyses may be found in Appendix E. After reviewing this submittal and evaluating the visibility improvement resulting from additional control approaches, the Department is proposing BART control levels and permit requirements as presented by this discussion.

Affected Boilers

Power boilers at each of the EGU sources are evaluated individually for BART eligibility under the category of "fossil-fuel fired steam electric plants of more than 250 mmBtu per hour." The Department identified 16 boiler units among the 9 EGU facilities as subject to a determination of BART controls (BART-affected). CALPUFF air quality modeling confirms this status (refer to Table 1 above), which showed that potential emissions from the BART-eligible boilers at each source could impair visibility greater than the subject-to threshold of 0.5 deciviews (dv) for more than 7 days of the year.

Baseline operation and equipment

According to state rule the BART analysis should be conducted according to federal guidance as provided in 40 CFR part 51, Appendix Y. As such the regulatory baseline for determining BART is the operations demonstrated by the affected units during the period of 2002, 2003, and 2004. The federal requirements also state that any analysis should consider current existing equipment, operation, and system configurations in evaluating control technologies. In cases where emission controls are in place the federal BART program requires that, at a minimum, the BART determination consider the "betterment of existing control equipment". This betterment considers if the equipment is being operated in the best manner possible or if there are modifications that can be made, so as to update the equipment comparable to current installations. The baseline information pertinent to the determination of PM related BART for the various EGU boilers is presented in Tables C1 to C4. Some control equipment modifications which took place before or during the 2002 – 2004 baseline period are listed in this section. These modifications are also included, and described more fully, in the “Betterment of Controls” section below.

Boilers with Electrostatic Precipitator (ESP) Control Units

1) *Alliant Energy - Columbia facility*. This facility has two BART-affected boilers, B21 and B22. Boiler B21 is a dry bottom boiler installed in 1971. The boiler has a heat input rating of 5,885 mmBtu/hr, and is permitted to burn coal, natural gas, No. 2 fuel oil, and additional alternate fuels. Boiler B22 is identical to B21, but was installed in 1975. Flue gas from each boiler exhausts through a dedicated stack with emissions controlled by an ESP (PM) and concentric firing over-fire air (NO_x).

The PM control system for boiler B21 is two hot side electrostatic precipitator units with a chevron design arrangement, installed in 1974. The PM control system for boiler B22 is two cold side ESP units (converted from hot side ESP units in 1988). Each control system includes a flue gas conditioning system. The facility also employs routine maintenance procedures to optimize performance of the ESP control units. The control levels for the baseline period were 99.2/96.4% (PM/ PM_{10}) and 99.5/99.5% (PM/ PM_{10}) for boilers B21 and B22, respectively, based on stack test results. The 2005 Air Emissions Inventory (AEI) Summary Report for Wisconsin indicates a PM_{10} control level of 97% for boiler B22. The Department assumes this control level is closer to the actual performance during the baseline period, and should be the assumed value associated with the visibility modeling below.

2) *Alliant Energy – Edgewater facility*. This facility has one BART-affected boiler, B24. The boiler is a cyclone type installed in 1967. Boiler B24 has a heat input rating of 3,529 mmBtu/hr, and is permitted to burn coal, No. 2 fuel oil, and cyclone air heater ash. Flue gas emissions from boiler B24 are controlled by an ESP (PM), as well as over-fire air and selective non-catalytic reduction (NO_x).

The ESP control system for boiler B24 is from Buell Engine Company, Inc., and was installed in 1969. The facility has taken several steps since original installation – in addition to routine maintenance procedures – to optimize performance of this ESP control unit:

- Physical flow distribution improvements
- Increased number of electrical fields from 4 to 12 fields
- Addition of flue gas conditioning
- Routine optimization: precipitator inspections performed during outages; rapping optimization; soot blowing optimization

The control level for the baseline period was 94.9/94.9% (PM/PM_{10}), based on stack test results.

3) *Alliant Energy – Nelson Dewey facility*. This facility has one BART-affected boiler, B22. The boiler is a cyclone type installed in 1961, but first operated in December of 1962. Boiler B22 has a heat input rating of 1,260 mmBtu/hr, and is permitted to burn sub-bituminous coal, bituminous coal, petroleum coke, metallurgical coke, and additional alternate fuels. Flue gas emissions from boiler B22 are controlled by an ESP (PM) and SCR (NO_x).

The ESP control system for boiler B24 is from Buell Engine Company, Inc., and was installed in 1974. Alliant Energy – Nelson Dewey has also taken a number of steps since original installation to optimize performance of the ESP control units:

- Precipitator inspections performed during outages
- Rapping optimization
- Soot blowing optimization
- Routine maintenance procedures

The control level for the baseline period was 95/95% (PM/PM_{10}), based on stack test results.

4) *We Energies – Oak Creek facility*. This facility has two BART-affected boilers, B27 and B28. Boiler B27 is a dry bottom boiler installed in 1965. The boiler has a heat input rating of 2,856 mmBtu/hr, and is permitted to burn coal, natural gas and propane. Boiler B28 is also a dry bottom boiler, installed in 1967. This boiler has a heat input rating of 3,009 mmBtu/hr, and is permitted to burn coal, natural gas and propane. Flue gas from each boiler exhausts through a dedicated stack with emissions controlled by an ESP (PM) and low NOx burners with over-fire air (NO_x).

The PM control systems for boilers B27 and B28 were installed in 1992 and 1991, respectively. The facility utilizes several plant-specific maintenance procedures to assure continued performance of the ESPs:

- Malfunction Prevention and Abatement Plan (MPAP)
- Routine maintenance procedures, as well as unusual operations procedures
- Continuous Emissions Monitoring Systems (CEMS) maintenance procedures, plus shutdown, breakdown or malfunction reporting

These procedures are periodically reviewed and updated by We Energies due to changes in operation, equipment, or regulatory requirements. The control levels for the baseline period were 99.92/96.92% (PM/PM_{10}) and 99.77/99.77% (PM/PM_{10}) for boilers B27 and B28, respectively, based on stack test results.

5) *We Energies – Pleasant Prairie facility*. This facility has two BART-affected boilers, B20 (Unit 1) and B21 (Unit 2). Boiler B20 is a dry bottom type installed in 1976, and first operated in 1980. The boiler has a heat input rating of 6,449 mmBtu/hr, and is permitted to burn coal, as well as distillate fuel oil and natural gas. Boiler B22 is identical to B21, and was first operated in 1985. Flue gas from each boiler exhausts through a dedicated stack with emissions controlled by an ESP (PM), SCR (NO_x) and wet FGD (SO2).

The PM control systems for boilers B20 and B21 were installed in 1980 and 1985, respectively. The facility utilizes several plant-specific maintenance procedures to assure continued performance of the ESPs:

- Malfunction Prevention and Abatement Plan (MPAP)
- Routine maintenance procedures, as well as unusual operations procedures
- Continuous Emissions Monitoring Systems (CEMS) maintenance procedures, plus shutdown, breakdown or malfunction reporting

These procedures are periodically reviewed and updated by We Energies due to changes in operation, equipment, or regulatory requirements. New automatic voltage and rapper/vibrator controllers were installed during 2000-2001, in order to digitally program and better control how the ESP plates are rapped and wires vibrated in order to optimize PM collection efficiency. Additional removal of PM at the wet FGD downstream of the ESP is estimated to be 50 to 70% by We Energies.

The control levels from the ESPs for the baseline period were 99.91/99.91% (PM/PM_{10}) and 99.75/99.75% (PM/PM_{10}) for boilers B20 and B21, respectively, based on stack test results.

6) *Wisconsin Public Service Corporation – JP Pulliam facility*. This facility has one BART-affected boiler, B27 (Unit 8). The boiler is a dry bottom type installed in 1964. Boiler B27 has a heat input rating of 1,510 mmBtu/hr, and is permitted to burn coal and natural gas. Flue gas emissions from boiler B27 are controlled by an ESP (PM), as well as over-fire air and selective non-catalytic reduction (NO_x).

The ESP control system for boiler B27 was installed in 1964, and reconstructed with new internal equipment and controls in 1994. The facility has taken several steps to optimize performance of this ESP control unit, in addition to routine precipitator inspections and maintenance:

- Installation of flue gas conditioning
- Precipitator voltage control equipment upgrades
- Modifications to ESP water wash system
- Replacement of primary coal crushers

The control level for the baseline period was 98.9/98.9% (PM/PM_{10}), based on stack test results.

Table C1. Baseline Operation of BART Boilers with ESP Control Units

Boiler Unit	Boiler Type	Boiler Installation Year	Maximum continuous rating (mmBtu/hr)
Alliant Energy			
Columbia – B21	Dry bottom	1971	5,885
Columbia – B22	Dry bottom	1975	5,885
Edgewater – B24	Cyclone	1967	3,529
Nelson Dewey – B22	Cyclone	1961	1,260
We Energies			
Oak Creek Station – B27	Dry bottom	1965	2,856
Oak Creek Station – B28	Dry bottom	1967	3,009
Pleasant Prairie – B20	Dry bottom	1976	6449
Pleasant Prairie – B21	Dry bottom	1976	6449
Wisconsin Public Service Corporation			
JP Pulliam – B27	Dry bottom	1964	1,510

Table C2. Baseline Operation of ESP Control Units on BART Boilers

Boiler Unit	ESP Installation Year	2002-2004 Baseline Emissions *		
		PM/PM_{10} Control Efficiency (%)	PM/PM_{10} Emission Rate (lbs/mmBtu)	Average PM/PM_{10} Emissions (tpy)
Alliant Energy				
Columbia – B21	1974	98.2 / 96.4	0.097 / 0.019	1836 / 361
Columbia – B22	1988	99.5 / 99.5	0.030 / 0.006	535 / 116
Edgewater – B24	1969	94.9 / 94.9	0.041 / 0.004	378 / 37
Nelson Dewey – B22	1974	95 / 95	0.031 / 0.011	97 / 35
We Energies				
Oak Creek Station – B27	1992	99.92 / 99.92	0.007 / 0.002	60 / 14
Oak Creek Station – B28	1991	99.77 / 99.77	0.015 / 0.003	116 / 26
Pleasant Prairie – B20	1980	99.91 / 99.91	0.001 / -	24 / -
Pleasant Prairie – B21	1985	99.75 / 99.75	0.006 / -	119 / -
Wisconsin Public Service Corporation				
JP Pulliam – B27	1994	98.9 / 98.9	0.033 / 0.006	158 / 30

* Emissions information based on Air Emissions Inventory Summary Reports for the 2002-2004 baseline.

<u>Boilers with Baghouse Control Units</u>

1) *Dairyland Power Coop – Alma facility*. This facility has one BART-affected boiler, B25. This boiler is a dry bottom type installed in 1973. Boiler B25 has a heat input rating of 3,784 mmBtu/hr, and is permitted to burn coal and No. 2 fuel oil. Flue gas emissions from the boiler are controlled by a baghouse (PM), a dry flue gas desulfurization (FGD) system (SO_2), and SCR (NO_x).

The PM control system for boiler B-25 during the 2002-2004 baseline period was an ESP. This system was replaced by a pulse-jet fabric filter (PJFF) baghouse in 2007. The baghouse is made up of 12 separate compartments each containing 1,064 bags. The facility also employs routine inspection and maintenance procedures to maintain performance of the baghouse. The PM_{10} control level for the baseline period (for the ESP) was 98.36%, based on stack test results. The Alma facility submitted a PM control level of 99.89% for boiler B25 (for the existing baghouse).

2) *Dairyland Power Coop – Genoa facility*. This facility has one BART-affected boiler, B20. This boiler is a dry bottom type installed in 1966. Boiler B20 has a heat input rating of 3,040 mmBtu/hr, and is permitted to burn coal. Flue gas emissions from the boiler are controlled by a baghouse (PM), a dry FGD system (SO2), and SCR (NO_x).

The PM control system for boiler B-20 during the 2002-2004 baseline period was an ESP. This system was replaced by a PJFF baghouse in 2007. The baghouse is made up of 10 separate compartments each containing 984 bags. The facility also employs routine inspection and maintenance procedures to maintain performance of the baghouse. The PM10 control level for the baseline period (for the ESP) was 97.67%, based on stack test results. The Genoa facility submitted a PM control level of 99.86% for boiler B20 (for the existing baghouse).

3) *We Energies – Valley facility*. This facility has four BART-affected boilers, B21 through B24. Boilers B21 and B22 are dry bottom boilers installed in 1968, while boilers B23 and B24 are dry bottom boilers installed in 1969. Boilers B21 and B22 each have a heat input rating of 868 mmBtu/hr, and are permitted to burn coal, petroleum coke, natural gas, and propane. Boilers B23 and B24 have a heat input rating of 840 mmBtu/hr, and are also permitted to burn coal, petroleum coke, natural gas, and propane. Flue gas streams from boilers B21 and B22 combine into a common duct and exhaust through a dedicated stack, with emissions controlled by a baghouse (PM). Flue gas streams from boilers B23 and B24 also combine into a common duct and exhaust through a dedicated stack, with emissions controlled by a baghouse (PM). Nitrogen oxides from these boilers are controlled by low-NOx burners and OFA. Also, under NOx RACT, SNCR may be utilized on these boilers in the future.

The PM control system for boilers B21 and B22 is a reverse air fabric filter, installed in 1994. The PM control system for boilers B23 and B24 is also a reverse air fabric filter, installed in 1995. The facility utilizes several plant-specific maintenance procedures to assure continued performance of the baghouses:

- Malfunction Prevention and Abatement Plan (MPAP)
- Routine maintenance procedures
- Continuous Emissions Monitoring Systems (CEMS) maintenance procedures, plus shutdown, breakdown or malfunction reporting

These procedures are periodically reviewed and updated by We Energies due to changes in operation, equipment, or regulatory requirements. The control levels for the baseline period were 99.86/99.86% (PM/PM_{10}) and 99.24/99.24% (PM/PM_{10}) for boilers B21 and B22, respectively, based on stack test results. For boilers B23 and B24, the control levels for the baseline period were 99.94/99.94% (PM/PM_{10}) and 99.95/99.95% (PM/PM_{10}), respectively, based on stack test results.

Table C3. Baseline Operation of BART Boilers with Baghouse Control Units

Boiler Unit	Boiler Type	Boiler Installation Year	Maximum continuous rating (mmBtu/hr)
Dairyland Power Coop			
Alma Station – B25	Dry bottom	1973	3,784
Genoa Station – B20	Dry bottom	1966	3,040
We Energies			
Valley Station – B21	Dry bottom	1968	868
Valley Station – B22	Dry bottom	1968	868
Valley Station – B23	Dry bottom	1969	840
Valley Station – B24	Dry bottom	1969	840

Table C4. Baseline Operation of Baghouse Control Units on BART Boilers

Boiler Unit	Baghouse Installation Year	2002-2004 Baseline Emissions		
		PM/PM$_{10}$ Control Efficiency (%)	PM/PM$_{10}$ Emission Rate (lbs/mmBtu)	Average PM/PM$_{10}$ Emissions (tpy)
Dairyland Power Coop				
Alma Station – B25 *	2007	Not applicable		
Genoa Station – B20 *	2007	Not applicable		
Wisconsin Energy				
Valley Station – B21	1994	99.86 / 99.86	0.011 / 0.002	24 / 4
Valley Station – B22	1994	99.24 / 99.24	0.059 / 0.010	119 / 19
Valley Station – B23	1995	99.94 / 99.94	0.025 / 0.004	55 / 9
Valley Station – B24	1995	99.95 / 99.95	0.025 / 0.004	53 / 9

* PM emissions during the 2002-2004 baseline period were controlled using an ESP.

Analysis of visibility and betterment of controls

The state BART rule requires each EGU facility to submit to the Department an analysis of the applicable pollutant control options and a proposed BART level of control for particulate matter. The Department is then required to propose a BART level of control and associated compliance requirements. Final BART requirements are incorporated into a facility's Title V operating permit.

The determination of BART control requirements for each source is based on the following five factors from US EPA under 40 CFR Part 51, Appendix Y, *Guidelines for BART Determinations Under the Regional Haze Rule*:

(1) The costs of compliance.
(2) The energy and non-air environmental impacts.
(3) Any existing pollution control technology in use at the source.
(4) The remaining useful life of the source.
(5) The degree of improvement in visibility which may reasonably be anticipated to result from the use of the technology.

In cases where emission controls are in place the federal BART program requires that, at a minimum, the BART determination considers the "betterment of existing control equipment". This betterment considers if the equipment is being operated in the best manner possible or if there are modifications that can be made, so as to update the equipment comparable to current installations. The existing installations of high-efficiency baghouses and electrostatic precipitators for BART-affected boilers require this betterment analysis.

Typical new equipment design PM control efficiencies for ESPs are between 99 and 99.9%, while some older ESPs only achieve 90%. ESPs with control levels on the lower end may be improved with upgrading and/or optimization. Current ESPs tend to be sized larger and have more fields. Typical new equipment design PM control efficiencies for baghouses are also between 99 and 99.9%, while older baghouses have a range between 95 and 99.9%.

The Department took the approach of first examining if any continuous visibility improvement could by achieved by further reduction of PM. The Department achieved this by conducting a visibility impact analysis of additional PM reductions at several of the BART units (see Visibility section below). Next, the Department assessed the extent of visibility improvement using CALPUFF by reducing currently reported PM emissions from these units. The Department then evaluated the potential for betterment at each unit. Finally, considering the visibility improvements and betterment analyses associated with additional controls, the Department made a PM related BART determination for each facility.

The Department allowed BART-affected sources to make an abbreviated PM related BART submittal, if the BART unit(s) is currently controlled by high efficiency PM collectors, and this control equipment is intended to continue operating in the future. This submittal included the following items:

- Description of the type of PM control equipment used, along with the range of collection efficiency expected from the properly operated control equipment.
- Installation date of the equipment.
- Answer the question: "Can existing PM control efficiency be improved without modifying the existing equipment configuration?"
- Maintenance procedures for the equipment.
- Description of PM related emission monitoring.
- Estimate of the remaining useful life of the BART unit.

These BART submittals are included in Appendix E.

I. Visibility Improvement from Additional PM Controls.

Visibility impacts due to emissions from EGU sources are largest in the Seney National Wildlife Refuge. Therefore, the measure used to evaluate the effectiveness of additional PM controls is the relative changes seen in visibility for this Class I area, quantified using the CALPUFF model. The emissions basis for the CALPUFF modeling is the source's actual maximum PM_{10} emissions – or "potential to emit" (PTE) if the maximum actual value was not available – demonstrated during the 2002 – 2004 BART baseline years. The Department used PM_{10} emissions because it was recommend in the *Guidelines* as an indicator for PM. Additional PM control applied to these emissions demonstrates a relative improvement in visibility. One basis for measuring visibility impacts is the relative improvement in the maximum day visibility impact (max dv). The other measure of visibility improvement evaluated is the number of days for which a change in visibility due to the additional controls can be quantified. This metric indicates the relative frequency and depth in visibility improvement.

<u>Electrostatic Precipitators</u>

The results of CALPUFF modeling for BART units utilizing ESP control are shown in Table C5. Additional information for the emission inputs and stack parameters are in Tables C6 and C7, respectively. The baseline maximum actual or PTE emissions of PM_{10} were used in the modeling. Presumptive BART controls/limits of 95% SO_2 control and 0.10 Lbs/mmBtu NOx were assumed for modeling, with a few exceptions where maximum actual emissions or NOx RACT limits were used, as noted in Table C6. The Department used 100% PM_{10} control as an extreme for additional control from the baseline maximum actual or PTE PM_{10} emissions, although 100% control is not possible in practice. The Department originally included additional non-BART boilers in the modeling of multi-facility PM reductions – we assume that inclusion of these non-BART boiler emissions does not change the visibility improvement associated with additional PM reductions from the BART boilers.

1) *Alliant Energy facilities*. Additional control of combined PM_{10} emissions from Columbia boilers B21 and B22 resulted in a modeled improvement from the baseline maximum visibility impairment of 0.02 dv, and a reduction of 2 days for the number of days with a maximum visibility impairment of 0.1 dv or greater. Boilers B21 and B22 each contribute roughly half to this visibility improvement, based on the modeled PM_{10} emission rates from each boiler. Additional control of PM_{10} emissions from Edgewater boiler B24 and Nelson Dewey boiler B22 resulted in a modeled improvement from the baseline maximum visibility impairment of 0.01 dv, for each boiler. The number of days with a maximum visibility impairment of 0.1 dv or greater had a reduction of 0 days, for each boiler.

2) *We Energies facilities*. The Department estimated the visibility improvement for additional PM control at the Oak Creek and Pleasant Prairie facilities based on the CALPUFF modeling results for the Alliant Energy – Columbia facility. The Oak Creek facility and Pleasant Prairie facility are both located south-east of the Columbia facility, and further from the Seney Class I area. Also, both facilities have similar or lower PM_{10} emission rates compared to the Columbia facility. Thus, additional controls at Oak Creek boilers B27 and B28, and Pleasant Prairie boilers

B21 and B22, are estimated to have an improvement from the baseline maximum visibility impairment of less than 0.01 dv, for each boiler. The number of days with a maximum visibility impairment of 0.1 dv or greater is estimated to have a reduction of 1 day or less, for each boiler.

3) *Wisconsin Public Service Corporation – JP Pulliam facility*. The JP Pulliam facility is located north-east of the Columbia facility, and nearer to the Seney Class I area. Additional PM control for boiler B27 resulted in a modeled improvement from the baseline maximum visibility impairment of 0.02 dv, and a reduction of 1 day for the number of days with a maximum visibility impairment of 0.1 dv or greater.

Table C5. Modeled Visibility Improvement Resulting from Additional PM Control for ESPs

<table>
<tr><th rowspan="3">Boiler Unit</th><th colspan="5">Visibility Impairment based on CALPUFF</th><th colspan="2" rowspan="2">Calculated Visibility Improvement</th></tr>
<tr><th colspan="3">2002-2004 Baseline</th><th colspan="2">100% PM_{10} Control on BART Boilers</th></tr>
<tr><th>PM-10 Control Efficiency (%)</th><th>Max day dv [a]</th><th>Days => 0.1 dv [b]</th><th>Max dv [a]</th><th>Days => 0.1 dv [b]</th><th>Dv improvement</th><th>Days => 0.1 dv</th></tr>
<tr><td colspan="8">Alliant Energy</td></tr>
<tr><td>Columbia – B21</td><td>96.4</td><td rowspan="6">2.95</td><td rowspan="6">108</td><td rowspan="2">2.93</td><td rowspan="2">106</td><td rowspan="2">2.95-2.93 = <u>0.02</u></td><td rowspan="2">108 - 106 = 2</td></tr>
<tr><td>Columbia – B22</td><td>97</td></tr>
<tr><td>Edgewater – B23, B25 *</td><td>-</td><td rowspan="2">2.94</td><td rowspan="2">108</td><td rowspan="2">2.95-2.94 = <u>0.01</u></td><td rowspan="2">108 - 108 = 0</td></tr>
<tr><td>Edgewater – B24</td><td>94.9</td></tr>
<tr><td>Nelson Dewey – B21 *</td><td>-</td><td rowspan="2">2.94</td><td rowspan="2">108</td><td rowspan="2">2.95-2.94 = <u>0.01</u></td><td rowspan="2">108 - 108 = 0</td></tr>
<tr><td>Nelson Dewey – B22</td><td>95</td></tr>
<tr><td colspan="8">WE Energies</td></tr>
<tr><td>Oak Creek – B27</td><td>99.92</td><td colspan="4" rowspan="2">Not modeled</td><td>< 0.01 (est.)</td><td>< 1 (est.)</td></tr>
<tr><td>Oak Creek – B28</td><td>99.77</td><td>< 0.01 (est.)</td><td>< 1 (est.)</td></tr>
<tr><td>Pleasant Prairie – B21</td><td>99.91</td><td colspan="4" rowspan="2">Not modeled</td><td>< 0.01 (est.)</td><td>< 1 (est.)</td></tr>
<tr><td>Pleasant Prairie – B22</td><td>99.75</td><td>< 0.01 (est.)</td><td>< 1 (est.)</td></tr>
<tr><td colspan="8">Wisconsin Public Service Corporation</td></tr>
<tr><td>JP Pulliam – B24,B25,B26 *</td><td>-</td><td rowspan="3">5.17</td><td rowspan="3">153</td><td rowspan="3">5.15</td><td rowspan="3">152</td><td rowspan="3">5.17-5.15 = <u>0.02</u></td><td rowspan="3">153 - 152 = 1</td></tr>
<tr><td>JP Pulliam – B27</td><td>98.9</td></tr>
<tr><td>Weston – B01,B02,B03 *</td><td>-</td></tr>
</table>

* Non-BART boilers.

[a] Maximum day visibility impairment measured in deciviews (only calculated at the Seney Class I area). Value based on results for 2003 year for Alliant Energy and 2002 year for WPSC.

[b] Number of days with maximum visibility impact => 0.1 deciviews. Value based on results for 2003 year.

Table C6. Individual Unit Baseline Emission Rates used for Modeling Results in Table C8

Boiler Unit	Emission Rate Type			Baseline Emissions (grams/sec)			Emissions after 100% PM Control on BART Boilers (grams/sec)		
	SO_2 [a]	NO_x [b]	PM_{10} [c]	SO_2	NO_x [b]	PM_{10}	SO_2	NO_x	PM_{10}
Alliant Energy									
Columbia – B21	95% control	0.10 Lbs/mmBtu	Max actual	27	70	19	27	70	0
Columbia – B22	95% control	0.10 Lbs/mmBtu	Max actual	27	68	15	27	68	0
Edgewater – B23 *	Max actual	0.15 Lbs/mmBtu	Assumed	67	13	13	67	13	13
Edgewater – B24	95% control	0.10 Lbs/mmBtu	Max actual	16	37	13	16	37	0
Edgewater – B25 *	Max actual	0.15 Lbs/mmBtu	Assumed	470	51	13	470	51	13
Nelson Dewey – B21 *	95% control	0.10 Lbs/mmBtu	Assumed	15	12	18	15	12	18
Nelson Dewey – B22	95% control	0.10 Lbs/mmBtu	PTE	15	12	18	15	12	0
WE Energies									
Oak Creek – B27	95% control	0.10 Lbs/mmBtu	Allowable	9	38	3.3	9	38	0
Oak Creek – B28	95% control	0.10 Lbs/mmBtu	Allowable	8	36	3.2	8	36	0
Pleasant Prairie – B21	95% control	0.10 Lbs/mmBtu	PTE	31	81	16.4	31	81	0
Pleasant Prairie – B22	95% control	0.10 Lbs/mmBtu	PTE	30	78	16.4	30	78	0
Wisconsin Public Service Corporation									
JP Pulliam – B24,B25,B26 *	Max actual	Max actual	Assumed	200	283	42	200	283	42
JP Pulliam – B27	95% control	0.10 Lbs/mmBtu	PTE	4	18	14	4	18	0
Weston – B21,B22,B23 *	Max actual	Max actual	Assumed	495	273	30	495	273	30

* Non-BART boilers.

[a] SO2 values are based on "Max actual" 30-day average emission rates for 2002-2004 baseline years reported to US EPA.

[b] NOx values are based on max actual for 2007.

[c] PM10 values are based on 2002-2004 baseline years.

Table C7. Stack Parameters at EGU Facilities with ESPs

Boiler	Facility ID	Stack ID	Stack Height (meters)	Stack Diameter (meters)	Gas Exit Velocity (meters/sec)	Stack Gas Exit Temperature (K)
Columbia – B21	111003090	S11	152.4	6.40	20.96	411
Columbia – B22	111003090	S12	198.1	6.40	18.96	405
Edgewater – B23 *	460033090	S11	167.6	5.18	17.09	416
Edgewater – B24	460033090	S11	167.6	5.18	17.09	416
Edgewater – B25 *	460033090	S12	167.6	5.18	20.77	405
Nelson Dewey – B21 *	122014530	S11	107.9	3.96	13.54	411
Nelson Dewey – B22	122014530	S11	107.9	3.96	13.54	411
Oak Creek – B27	241007690	S14	169.8	5.27	27.81	398
Oak Creek – B28			169.8	5.27	27.81	398
Pleasant Prairie – B21	230006260	S10	137.2	9.14	30.91	400
Pleasant Prairie – B22	230006260	S10	137.2	9.14	30.91	400
JP Pulliam – B24,B25 *	405031990	S12	114.9	4.57	8.41	403
JP Pulliam – B26 *	405031990	S13	114.9	3.35	12.1	433
JP Pulliam – B27	405031990	S14	114.9	4.76	8.65	441
Weston – B01 *	737009020	S01	73.8	3.81	5.36	422
Weston – B02 *	737009020	S02	73.8	3.81	7.98	422
Weston – B03 *	737009020	S03	151.2	4.88	20.32	422
* Non-BART boilers.						

Baghouses

The results of CALPUFF modeling for BART units utilizing existing baghouse controls are shown in Table C8. Additional information for the emission inputs and stack parameters are in Table C9 and C10, respectively. The baseline maximum actual or PTE emissions of PM_{10} were used in the modeling. Presumptive BART controls/limits of 95% SO_2 control and 0.10 or 0.17 Lbs/mmBtu NOx were also assumed for modeling, as noted in Table C6. The Department used 100% PM_{10} control as an extreme for additional control from the baseline maximum actual or PTE PM10 emissions, although 100% control is not possible in practice. The Department originally included additional non-BART boilers in the modeling of multi-facility PM reductions – we assume that inclusion of these non-BART boiler emissions does not change the visibility improvement associated with additional PM reductions from the BART boilers.

1) *Dairyland Power Coop facilities*. The Department estimated the visibility improvement for additional PM control at the Alma facility based on the CALPUFF modeling results for the Alliant Energy – Columbia facility. The Alma facility is located north-west of the Columbia facility, and further from the Seney Class I area. Also, the facility has lower PM_{10} emission rates compared to either of the Columbia facility BART boilers. Thus, additional controls at Alma B25 is estimated to have an improvement from the baseline maximum visibility impairment of less than 0.01 dv, and a reduction of 1 day or less for the number of days with a maximum visibility impairment of 0.1 dv or greater.

The Department estimated the visibility improvement for additional PM control at the Genoa facility based on the CALPUFF modeling results for the Alliant Energy – Columbia facility. The Genoa facility is located west of the Columbia facility, and further from the Seney Class I area. Also, the facility has a similar PM_{10} emission rate compared to each of the Columbia facility BART boilers. DNR estimates additional controls at Genoa B20 to have an improvement from the baseline maximum visibility impairment of less than 0.01 dv, and a reduction of 1 day or less for the number of days with a maximum visibility impairment of 0.1 dv or greater..

2) *We Energies – Valley facility*.

The Department estimated the visibility improvement for additional PM control at the Valley facility based on the CALPUFF modeling results for the Alliant Energy – Columbia facility. The Valley facility is located south-east of the Columbia facility, and further from the Seney Class I area. Also, the facility has similar PM_{10} emission rates compared to each of the Columbia facility BART boilers. Thus, additional controls at Valley boilers B21, B22, B23, and B24 are estimated to have an improvement from the baseline maximum visibility impairment of less than 0.01 dv, for each boiler. The number of days with a maximum visibility impairment of 0.1 dv or greater is estimated to have a reduction of 1 day or less, for each boiler.

Table C8. Modeled Visibility Improvement Resulting from Additional PM Control for Baghouses

Boiler Unit	Visibility Impairment based on CALPUFF					Estimated Visibility Improvement	
	Baseline			100% PM_{10} Control on BART Boilers			
	PM-10 Control Efficiency (%)	Max day dv [b]	Days => 0.1 dv [c]	Max dv [b]	Days => 0.1 dv [c]	Dv improvement	Days => 0.1 dv
Dairyland Power Coop							
Alma Station – B25 [a]	98.36	Not modeled				< 0.01	< 1
Genoa Station – B20 [a]	97.67	Not modeled				< 0.01	0 – 1
We Energies							
Valley Station – B21	99.86	Not modeled				0.01	0 – 1
Valley Station – B22	99.24					0.01	0 – 1
Valley Station – B23	99.94					0.01	0 – 1
Valley Station – B24	99.95					0.01	0 – 1

[a] PM emissions during the 2002-2004 baseline period were controlled using an ESP.
[b] Maximum day visibility impairment measured in deciviews (only calculated at the Seney Class I area). Value based on results for 2003 year for Alliant Energy and 2002 year for WPSC.
[c] Number of days with visibility impairment => 0.1 deciviews. Value based on results for 2003 year.

Table C9. Individual Unit Baseline Emission Rates used for Modeling Results in Table C8

Boiler Unit	Emission Rate Type			Baseline Emissions (grams/sec)			Emissions after 100% PM Control on BART Boilers (grams/sec)		
	SO_2 [a]	NO_x [b]	PM_{10} [c]	SO_2	NO_x [b]	PM_{10}	SO_2	NO_x	PM_{10}
Dairyland Power Coop									
Alma Station – B25	95% control	0.10 Lbs/mmBtu	PTE	17	45	5.4	17	45	0
Genoa Station – B20	95% control	0.10 Lbs/mmBtu	PTE	33	37	18.5	33	37	0
Wisconsin Energy									
Valley Station – B21	95% control	0.17 Lbs/mmBtu	PTE	7	12	16	7	12	0
Valley Station – B22	95% control	0.17 Lbs/mmBtu	PTE	7	12	16	7	12	0
Valley Station – B23	95% control	0.17 Lbs/mmBtu	PTE	7	13	16	7	13	0
Valley Station – B24	95% control	0.17 Lbs/mmBtu	PTE	7	12	16	7	12	0

[a] SO2 values are based on “Max actual" 30-day average emission rates for 2002-2004 baseline years reported to US EPA.

[b] NOx values are based on max actual for 2007.

[c] PM10 values are based on 2002-2004 baseline years.

Table C10. Stack Parameters at EGU Facilities with Baghouses

Boiler	Facility ID	Stack ID	Stack Height (meters)	Stack Diameter (meters)	Gas Exit Velocity (meters/sec)	Stack Gas Exit Temperature (K)
Alma Station – B25	606034110	S11	213.4	5.33	27.98	446
Genoa Station – B20	663020930	S10	152.4	4.62	35.35	425
Valley Station – B21	241007800	S11	121.9	3.35	18.00	411
Valley Station – B22	241007800	S11	121.9	3.35	18.00	411
Valley Station – B23	241007800	S12	121.9	3.35	17.29	411
Valley Station – B24	241007800	S12	121.9	3.35	17.29	411

II. Betterment of Controls

As mentioned above, the BART determination should at least consider the "betterment of existing control equipment" in cases where ESPs or baghouses are in place. In addition to optimizing the equipment operation, there are also modifications which can be made in order to update the equipment. For ESPs these modifications include, but are not limited to, the following:

- *Addition of electric fields*. Electric fields may be added to the existing fields in order remove additional PM.
- *Ammonia injection*. This system improves the cohesiveness of the dust layer formed on the collecting plates and typically results in less fly-ash re-entrainment when the plates are rapped. Drawbacks of this system include high capital cost and personnel safety in handling the ammonia.
- *ESP voltage control equipment upgrades*. The control equipment is designed to manage ESP collection efficiency by controlling the magnitude of voltage on the primary winding of the Transformer Rectifier (TR) Sets.
- *Flue gas conditioning*. This typically consists of SO3 addition to decrease the resistivity of fly ash produced from the combustion of low sulfur coals. Decreased resistivity improves ESP collection efficiency. A dry sulfur pellet system may also be used to increase the reliability and safety of the system.
- *Modifications to rapper equipment, controls and sequencing of rappers*. Rapping is optimized by balancing the need to keep plates clean with the re-entrainment of dust.
- *Physical flow distribution improvements*. Even and consistent distribution of flue gas within/across the ESP, as well as flue gas velocity adjustments, improve precipitator performance. Velocity impacts the residence time of the flue gas within the ESP and therefore the contact time between the flue gas and ESP fields.
- *Soot blowing optimization*. Soot blowing intervals are optimized to balance cleaning with increased dust.
- *Water wash modifications*. Washing of the ESPs removes a built up layer of ash that collects on ESP discharge electrodes.

For baghouses, in addition to equipment optimization, modifications primarily include upgrading fabric filter material and addition of baghouse compartments. Also, the Department views the addition of electric fields or baghouse compartments as "modifying the existing equipment configuration," and did not require the facilities to evaluate this option under an analysis for betterment of controls.

<u>Electrostatic Precipitators</u>

1) Alliant Energy - Columbia facility. The Columbia facility submitted PM control levels of 99.1% and 99.5% for boilers B21 (Unit 1) and B22 (Unit 2), respectively. The analysis for betterment of control indicates continuous maintenance procedures and high PM control levels for these ESPs. In February 2011, WPL received approval from the PSCW to install scrubbers and baghouses at Columbia Units 1 and 2 to reduce SO2 and mercury emissions, respectively, at the generating facility. The scrubbers and baghouses at Columbia Units 1 and 2 are expected to be placed into service in 2014 and support compliance obligations for current and anticipated air quality regulatory requirements, including CATR, the Utility MACT Rule and the Wisconsin State Mercury Rule. The ESP will remain operating at Columbia - the baghouse will supplement the existing controls and in particular is being added to help support compliance for reasons related to other emissions including SO2 and mercury. The additional PM reduction from the baghouse is a co-benefit and the permitting process will require a new Title V operating permit PM limit in order to ensure no significant net increases of PM emissions after the project has been completed. The permit limitation for PM is expected to be proposed by Alliant in July 2011 – the PM limit and resulting emissions will be lower for B21 after installation of the baghouse. The proposed PM permit limitation will be made available for public comment as part of the draft Regional Haze SIP public comment period.

2) *Alliant Energy – Edgewater facility*. The Edgewater facility submitted a PM control level of 94.9% (PM, PM_{10}) for boiler B24. The Department had concerns about this control efficiency, and requested additional information from the facility to justify why a higher level of control is not demonstrated. For example, a control level similar to the ESP control unit at Nelson Dewey cyclone boiler B22 seems reasonable, because the flue gas conditions are similar for each boiler. The facility responded that it has taken several steps since original installation – in addition to additional electrical fields and routine maintenance procedures – to better the control of this ESP control unit:

- Physical flow distribution improvements.
- Addition of flue gas conditioning.
- Rapping optimization and soot blowing optimization.

The Department expects the next stack test to be higher than 95%, based on the above improvements which may not have been reflected in the most recent testing.

3) *Alliant Energy – Nelson Dewey facility*. The Nelson Dewey facility submitted control levels of 97.1% (PM) and 95% (PM_{10}) for boiler B22 as part of its PM BART analysis. These values were confirmed by a 2005 stack test. The facility followed up with a more recent stack test which showed removal efficiencies above 98% for PM. The facility has optimized rapping and soot blowing to better the control of this ESP control unit. The analysis for betterment of control indicates a high PM control level and steps taken to minimize emissions from this ESP.

4) *WE Energies – Oak Creek facility*. The Oak Creek facility submitted PM control levels of 99.92 and 99.77% for boilers B27 and B28, respectively. Additionally, for SO_2 control the facility plans to install wet FGD downstream of the ESP by 2013, which is expected to yield an additional 50 to 70% removal of PM. The analysis for betterment of control indicates continuous maintenance procedures and very high PM control levels for these ESPs.

5) *WE Energies – Pleasant Prairie facility*. The Pleasant Prairie facility submitted a PM control level of 99.91 and 99.75% (PM, PM_{10}) for boilers B21 and B22, respectively. The analysis for betterment of control indicates continuous maintenance procedures and very high PM control levels for these ESPs.

6) *Wisconsin Public Service Corporation – JP Pulliam facility*. The JP Pulliam facility submitted a PM control level of 99.8% for boiler B27. The facility also evaluated additional ESP configuration changes to determine if the ESP performance would be improved effectively. The evaluated improvements included modifications to rapper equipment, controls, and sequencing of the rappers. The evaluation showed that these projects together would result in incremental efficiency gains of less than 0.05%. An ammonia injection system was also evaluated, but was not implemented for the cost and safety issues mentioned above for this technology. The analysis for betterment of control indicates a very high PM control level and an evaluation of upgrade options for this ESP.

Baghouses

1) *Dairyland Power Coop – Alma facility*.

The Alma facility submitted a PM control level of 99.89% for boiler B25. The pulse-jet fabric filter (PJFF) baghouse system was installed in 2007 (operational in 2009) as a replacement for an ESP. The manufacturer guaranteed PM emissions are not to exceed 0.015 pounds/mmBtu, excluding the back half section. The analysis for betterment of control indicates continuous maintenance procedures and a very high PM control level for this baghouse system.

2) *Dairyland Power Coop – Genoa facility*.

The Genoa facility submitted a PM control level of 99.86% for boiler B20. The pulse-jet fabric filter (PJFF) baghouse system was installed in 2007 (operational in 2009), and replaced an ESP. The manufacturer guaranteed PM emissions are not to exceed 0.015 pounds/mmBtu, excluding the back half section; and 0.034 pounds/mmBtu, including the back half section. The analysis for betterment of control indicates continuous maintenance procedures and a very high PM control level for this baghouse system.

3) *We Energies – Valley facility*.

The Pleasant Prairie facility submitted PM control levels of 99.91 and 99.75% (PM, PM_{10}) for boilers B21 and B22, respectively. Baghouses for boilers B21 and B22 were installed in 1994, while the baghouses for boilers B23 and B24 were installed in 1995. The analysis for betterment of control indicates continuous maintenance procedures and very high PM control levels for these baghouse systems.

III. Proposed BART Controls and Visibility Improvement

Electrostatic Precipitators

All but two of the Wisconsin utility boilers subject to BART and employing ESP control systems have a tested PM control efficiency greater than 99%. The ESP for Alliant Energy – Nelson Dewey boiler B22, which is older than ESPs at other EGU facilities, is greater than 98% PM control. The ESP for Alliant Energy – Edgewater B24, which is older than the ESP at Nelson Dewey, is greater than 94% PM control. The Department performed CALPUFF modeling using an established baseline to determine visibility impacts for additional controls on the ESPs. After applying additional PM_{10} controls up to 100% at ESPs, the modeled improvement from the baseline maximum visibility impairment is 0.01 dv or less at all but one boiler unit. The modeling result with additional controls at the JP Pulliam boiler unit showed an improvement in the baseline maximum visibility of 0.02 dv. Although visibility impacts above the 0.01 dv modeled estimate are possible at the Columbia B21 PM permit level of 0.6 lbs/mmBtu, the PM controls are operated at a very high level achieving PM and PM_{10} emission rates less than 0.1 lbs/mmBtu and 0.02 lbs/mmBtu, respectively. Columbia is also subject to malfunction and abatement plans for operating control equipment under s. NR 439 consistent with testing parameters, and will have a lower PM limit and lower resulting emissions for B21 after a baghouse installation scheduled for 2014. The number of days with a maximum visibility impairment of 0.1 dv or greater had a reduction of only 1 day or less for each boiler unit. In addition, the cost of incremental visibility improvement is likely to be very high for any additional PM control by modifying the existing equipment configuration. Due to the small visibility improvement from increasing PM control efficiency, the Department determined BART for PM to be the existing PM controls and permit conditions.

Baghouses

All of the Wisconsin utility boilers subject to BART and employing baghouse control systems have a tested PM control efficiency greater than 99%. The Department performed CALPUFF modeling using an established baseline to determine visibility impacts for additional controls on the baghouses. After applying additional PM_{10} controls up to 100% at baghouses, the modeled improvement from the baseline maximum visibility impairment is 0.01 dv or less for each boiler unit. The number of days with a maximum visibility impairment of 0.1 dv or greater had a reduction of only 1 day or less for each boiler unit. In addition, the cost of incremental visibility improvement is likely to be very high for additional PM control by modifying the existing equipment configuration. Due to the small visibility improvement from increasing PM control efficiency, the Department determined BART for PM to be the existing PM controls and permit conditions.

IV. Permit requirements

The Department is proposing the BART PM permit limitations in Tables C11 and C12 for public comment. The permit requirements are the existing Title V permit limits and conditions for PM. These limits establish *continuous* control, in accordance with the *Guidelines*. The Department determines that the existing PM control equipment and permit limitations for each BART-affected boiler represents BART. The proposed BART requirements include compliance demonstrated through periodic stack testing.

Since the Department is not proposing significant changes to the permits at this point, a template for the draft revision of each EGU facility's Title V operating permit, which includes the proposed BART requirements, is presented in Appendix D.

Table C11. Proposed BART Determination for EGU BART Sources with ESP Control

Unit	PM Permit Emission Limit (Lbs/mmBtu)
Alliant Energy	
Columbia – B21	0.60
Columbia – B22	0.10
Edgewater – B24	0.13
Nelson Dewey – B22	0.10
WE Energies	
Oak Creek – B27	0.03
Oak Creek – B28	0.03
Pleasant Prairie – B21	0.10
Pleasant Prairie – B22	0.10
Wisconsin Public Service Corporation	
JP Pulliam – B27	0.30

Table C12. Proposed BART Determination for EGU BART Sources with Baghouse Control

Unit	PM Permit Emission Limit (Lbs/mmBtu)
Dairyland Power Coop	
Alma Station – B25	0.10
Genoa Station – B20	0.034
WE Energies	
Valley Station – B21	0.15
Valley Station – B22	0.15
Valley Station – B23	0.15
Valley Station – B24	0.15

Appendix D. Draft Title V Operating Permits for EGUs

Note: The template that follows will be used for proposed BART language within each permit.

PART *X*: BEST AVAILABLE RETROFIT TECHNOLOGY (BART)
(Note: Text that is underlined and highlighted in gray varies between different boilers)

1.0 Applicability

A Best Available Retrofit Technology (BART) determination has been made for the BART-subject emission units at this facility to comply with the requirements of 40 CFR Part 51. These requirements are submitted as a Title V air permit revision.

2.0 BART-affected Unit Description

Boiler *X* was brought into service in *YEAR.* This boiler relies on *TYPE* coal. Boiler *X* is rated at *XX* mmBtu/hr and exhausts to *its own stack*. The boiler has an *ESP/baghouse* currently in-use for controlling particles and meeting opacity requirements.

3.0 BART Determination

Best Available Retrofit Technology (BART) applies to boiler *X*.
(a) BART shall be applied no later than December 31, 2015.
(b) BART for particulate matter (PM) emissions has been determined to be:
(i.) The existing PM emission limitations specified in Conditions *XX* and *XX*, as well as compliance with the visible emissions limitations specified in Condition *XX*;
(ii) Compliance with the Compliance Assurance Monitoring (CAM) Plan in Part *X*, and the Malfunction Prevention and Abatement (MPA) Plan, located in Part *X*;
[ss. NR 415.03 and NR 433.05, Wis. Adm. Code]
Note: Any revisions to the CAM Plan will be part of future Title V permit renewals.

Appendix E. PM BART Analyses from EGU Sources in Wisconsin

Appendix E.1. PM BART Analysis and Responses from Alliant Energy – Columbia

Appendix E.2. PM BART Analysis and Responses from Alliant Energy – Edgewater

Appendix E.3. PM BART Analysis and Responses from Alliant Energy – Nelson Dewey

Appendix E.4. PM BART Analysis and Responses from Dairyland Power Coop – Alma

Appendix E.5. PM BART Analysis and Responses from Dairyland Power Coop – Genoa

Appendix E.6. PM BART Analysis from We Energies – Oak Creek

Appendix E.7. PM BART Analysis from We Energies – Pleasant Prairie

Appendix E.8. PM BART Analysis from We Energies – Valley

Appendix E.9. PM BART Analysis and Responses from Wisconsin Public Service Corporation – Pulliam

Appendix E.1. PM BART Analysis from Alliant Energy – Columbia for Boiler Units B21 (1) and B22 (2), March 5, 2009.

Columbia Units 1&2 Particulate Matter BART Determination Data	
Requested Data	**Response**
Description of the type of PM control equipment used, along with the range of collection efficiency expected from the properly operated control equipment	The ESPs on Columbia Units 1&2 were manufactured by Research Cottrell. Unit 1 has a control efficiency of 99.1% and Unit 2 has a control efficiency of 99.5%
Installation date of the equipment	Columbia Unit 1 ESP was installed as original equipment in 1975. Columbia Unit 2 ESP was originally installed in 1978 and converted to a cold-side ESP in 1988.
Can existing PM control efficiency be improved without modifying the existing equipment configuration?	Since primary particulate contributions to visibility impairment at Class 1 areas are insignificant and because both ESPs are operating at above 99% control efficiency, existing ESP operations can not be improved upon in any way that would make significant visibility improvement at Class I areas.
Maintenance procedures for the equipment	Maintenance procedures are outlined in the facility's Malfunction Prevention and Abatement Plan, which is a requirement of the Title V permit program. In addition, compliance assurance monitoring (CAM) plan protocols, recordkeeping and reporting requirements are in the Title V operating permit.
Description of PM related emission monitoring	Columbia Units 1&2 have continuous opacity monitors and have compliance stack test requirements in the Title V permit.
Estimate of the remaining useful life of the BART unit	The existing ESPs in-use on Columbia Units 1&2 are presumed to meet the BART level of control for PM. With this high efficiency control equipment in-use on both units, the Department has concluded that the cost of incremental visibility improvement would appear to be very high as there would be no significant visibility improvement from installing additional PM controls. Therefore, since WPL is not evaluating the cost-effectiveness of any additional PM controls, this question is not applicable.

Appendix E.2. PM BART Analysis from Alliant Energy – Edgewater for Boiler Unit B24 (4), March 5, 2009.

Edgewater Unit 4 Particulate Matter BART Determination Data	
Requested Data	**Response**
Description of the type of PM control equipment used, along with the range of collection efficiency expected from the properly operated control equipment	The ESP on Edgewater Unit 4 was manufactured by Research Cottrell and has a control efficiency of 94.9%
Installation date of the equipment	Edgewater Unit 4 ESP was installed as original equipment in 1969.
Can existing PM control efficiency be improved without modifying the existing equipment configuration?	Since primary particulate contributions to visibility impairment at Class 1 areas are insignificant and because the ESP operates at above 94% control efficiency, existing ESP operations can not be improved upon in any way that would make significant visibility improvement at Class I areas.
Maintenance procedures for the equipment	Maintenance procedures are outlined in the facility's Malfunction Prevention and Abatement Plan, which is a requirement of the Title V permit program. In addition, compliance assurance monitoring (CAM) plan protocols, recordkeeping and reporting requirements are in the Title V operating permit.
Description of PM related emission monitoring	Edgewater Unit 4 has a continuous opacity monitor and has compliance stack test requirements in the Title V permit.
Estimate of the remaining useful life of the BART unit	The existing ESP in-use on Edgewater Unit 4 is presumed to meet the BART level of control for PM. With this high efficiency control equipment in-use on this unit, the Department has concluded that the cost of incremental visibility improvement would appear to be very high as there would be no significant visibility improvement from installing additional PM controls. Therefore, since WPL is not evaluating the cost-effectiveness of any additional PM controls, this question is not applicable.

Appendix E.2. Response from Alliant Energy – Edgewater Regarding PM Control on Boiler Unit B24 (4), June 22, 2009.

Dear Mr. Loftus:

Wisconsin Power and Light Company (WPL) submits this letter in response to your e-mail received June 4, 2009.

In your correspondence you requested a sufficient explanation as to why the electrostatic precipitator (ESP) control efficiency at Edgewater Unit 4 (documented at 94.9% removal efficiency) is lower than other ESPs of which the department is aware.

Although the ESP has a control efficiency documented to be lower than other units, the controlled particulate emissions are significantly lower than Edgewater Unit 4's 0.6 lb/mmbtu permit limit. Since its original installation several improvements have been made to this ESP resulting in particulate emission levels that are about 10% of their limit.

- Physical flow distribution improvements,
- Increased number of electrical fields from 4 to 12 fields,
- Addition of flue gas conditioning, and
- Optimization of rapping sequence.

Recall that maximum 24-hour emissions were used in the modeling analysis documenting particulate emissions from Unit 4 and were found to have had negligible impacts to visibility at Class I areas.

WPL will continue to properly maintain the ESP on Unit 4 and believes that no further measures or modifications to existing equipment could improve performance and more importantly, would not have any detectable improvements to visibility at Class I areas. WPL believes that the most prudent and effective approach to BART for PM will be to implement enforceable measures in a compliance assurance monitoring (CAM) plan, included in the facility's Title V permit, that describe how the ESP will be maintained to assure high control efficiency levels. This practical approach will provide more meaningful long-term results, rather than targeting the % levels and involving additional costly testing that will only provide a snapshot of information.

Appendix E.2. Response from Alliant Energy – Edgewater Regarding PM Control on Boiler Unit B24 (4), June 22, 2009 (cont.).

If you have further questions or comments please feel free to contact me at 608-458-3457.

Regards,

Jeffrey M. Jacckels, P.E.
Senior Environmental Specialist

Appendix E.2. Response from Alliant Energy – Edgewater Regarding PM Control on Boiler Unit B24 (4), April 28, 2010 (cont.)

From: Pincombe, Bradley [mailto:BradleyPincombe@alliantenergy.com]
Sent: Wednesday, April 28, 2010 11:11 AM
To: Loftus, Jonathan P - DNR
Cc: Hanson, Jeffrey; Pluta, Michele
Subject: RE: ESP Performance at Edgewater 4

Jon,

In his 4/15/2010 e-mail to you below, Jeff Jaeckels advised that due to some out-of-office situations (and due to his impending departure) there would be a slight delay in our response to your questions concerning the performance of the Edgewater Unit 4 ESP. I apologize for that delay but am now able to provide the following information:

- WPL has not performed any recent testing on the performance of Edgewater Unit 4's ESP.
- As you suggest, the difference in performance cited in our PM BART submittals between the Edgewater Unit 4 ESP and the Nelson Dewey Unit 2 ESP is likely attributable to several factors. The following are notable (but may not be the only) potential factors behind why the documented efficiency may differ for these units:

1. The EDG4 ESP was installed as original equipment when the unit was constructed and went into service in 1969. The NED2 ESP was retrofitted to that unit in 1974. The NED2 ESP is in fact newer than the EDG4 ESP.

2. Even and consistent distribution of flue gas within/across the ESP improves precipitator performance and the newer NED2 ESP benefitted from tighter specifications on flue gas distribution. As noted in our 6/22/2009 letter, improvements have been made to the EDG4 ESP to address/improve flue gas distribution but flue gas distribution remains a differentiating factor in performance between the EDG4 and NED2 ESPs.

3. Likewise, flue gas velocity differs between the NED2 and EDG4 ESPs. Velocity – which impacts the residence time of the flue gas within the ESP and therefore the contact time between the flue gas and ESP fields – impacts the control efficiency/performance of the precipitator. It is our understanding that the flue gas moves thru the ESP at EDG4 at approx 3-4 feet/second faster than it does thru the NED2 ESP. Again, as noted in our 6/22/2009 letter, improvements have been to the EDG4 ESP to address velocity however flue gas velocity is another differentiating factor in performance between the EDG4 and NED2 ESPs.

WPL maintains both of these ESPs in accordance with the plants' compliance assurance monitoring plans and routinely performs compliance tests for Title V operating permit requirements limiting particulate matter emissions. We believe that this is the most relevant indication of actual ESP performance at the plants.

Again, Jeff Hanson and Michele Pluta are available and should both be contacted should you require further information to address your questions regarding the performance of EDG4's ESP. In Jeff Jaeckels' absence, we collectively look forward to working with you as you progress the PM BART determinations.

Brad Pincombe
Manager, Environmental Services Emerging Issues & Strategic Projects
Alliant Energy
(608) 458-4928 Desk
(608) 575-7154 Cell

bradleypincombe@alliantenergy.com

Appendix E.3. PM BART Analysis from Alliant Energy – Nelson Dewey for Boiler Unit B22 (2), March 5, 2009.

Nelson Dewey Unit 2
Particulate Matter BART Determination Data

Requested Data	Response
Description of the type of PM control equipment used, along with the range of collection efficiency expected from the properly operated control equipment	The ESP on Nelson Dewey Unit 2 was manufactured by Research Cottrell and has a control efficiency of 95.0 - 97.1%
Installation date of the equipment	Nelson Dewey Unit 2 was placed into service in 1962. The ESP was installed in 1974.
Can existing PM control efficiency be improved without modifying the existing equipment configuration?	Since primary particulate contributions to visibility impairment at Class 1 areas are insignificant and because the ESP operates at 95% or above control efficiency, existing ESP operations can not be improved upon in any way that would make significant visibility improvement at Class I areas.
Maintenance procedures for the equipment	Maintenance procedures are outlined in the facility's Malfunction Prevention and Abatement Plan, which is a requirement of the Title V permit program. In addition, compliance assurance monitoring (CAM) plan protocols, recordkeeping and reporting requirements are in the Title V operating permit.
Description of PM related emission monitoring	Nelson Dewey Unit 2 has a continuous opacity monitor and has compliance stack test requirements in the Title V permit.
Estimate of the remaining useful life of the BART unit	The existing ESP in-use on Nelson Dewey Unit 2 is presumed to meet the BART level of control for PM. With this high efficiency control equipment in-use on this unit, the Department has concluded that the cost of incremental visibility improvement would appear to be very high as there would be no significant visibility improvement from installing additional PM controls. Therefore, since WPL is not evaluating the cost-effectiveness of any additional PM controls, this question is not applicable.

Appendix E.3. Response from Alliant Energy – Nelson Dewey for Boiler Unit B22 (2), April 20, 2009.

ALLIANT ENERGY.

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April 20, 2009

Jon Loftus
Bureau of Air Management
Wisconsin Department of Natural Resources
101 South Webster Street
Box 7921
Madison, Wisconsin 53707-7921

RE: Nelson Dewey Unit 2 Particulate Matter Best Available Retrofit Technology (BART) Determination
FID 122014530
Follow-Up to E-mail Requests Made to Jeff Jaeckels on March 18, 2009 and March 19, 2009

Dear Mr. Loftus:

Wisconsin Power and Light Company (WPL) submits this letter is in response to your e-mails received March 18 and March 19, 2009. In those communications you asked WPL "to address if there is something that [we] can do to the existing [Nelson Dewey Unit 2 electrostatic precipitator/ESP] operation without significant cost to significantly improve efficiency." You also asked for clarification on the statement made in our March 5, 2009 BART filing regarding the remaining useful life of this unit.

Responses to these inquiries are provided in the context of the five factors to be addressed in the BART analysis.

Degree of Visibility Improvement – As documented previously, direct particulate matter (PM) has negligible impact on visibility at the Class I areas from this unit. It is for this reason that WPL determined that the existing high-efficiency ESP at Nelson Dewey Unit 2 meets a BART level of control for PM.

Air Pollution Control Equipment in Use at the Source – The Nelson Dewey Unit 2 ESP is maintained to meet Title V particulate emission and opacity limits. In the course of normal operations, maintenance is performed and specific improvements are made to sustain and/or improve the performance of the ESP to ensure that the unit operates within these limitations. The following are examples of actions taken to optimize the performance of the Nelson Dewey Unit 2 ESP:

- Precipitator Inspections – Inspections are performed during outages to evaluate the general condition of the ESP and to identify the need for and then make repairs as necessary to sustain ESP performance

Appendix E.3. Response from Alliant Energy – Nelson Dewey for Boiler Unit B22 (2), April 20, 2009 (cont.).

- Rapping Optimization – Rapping has been optimized by balancing the need to keep plates clean with the re-entrainment of dust.
- Soot Blowing Optimization – Soot blowing intervals have been optimized to balance cleaning with increased dust.

Cost of Compliance – The cost of operating the Nelson Dewey Unit 2 high-efficiency ESP to comply with Title V PM limitations is considered by WPL to be the baseline compliance cost for this BART PM analysis. Because the ESP is currently maintained/optimized to meet this limitation and because any visibility improvements resulting from reductions in PM emissions by units already operating with high-efficiency PM control devices have been determined by the WDNR to be insignificant, WPL believes no improvements in current PM control performance can be made on this unit without significant cost.

Energy and Non-Air Quality Environmental Impacts – WPL is neither proposing changes to the Nelson Dewey Unit 2 ESP configuration/operation or the retrofit of additional PM controls. As such, this factor is not applicable.

The Remaining Useful Life of the Source – This factor is applicable when considering the amortization schedule for any proposed retrofit emission controls and is of importance only if the value will be less than the time period for amortizing the cost of the control. Since no retrofit controls are being proposed, this factor is not applicable. The ESP can be assumed to operate over the remaining life of the unit.

WPL appreciates your feedback/follow-up on our March 5, 2009 BART PM analysis and remains committed to working with you to "get to done" on this effort. If you have further questions or comments please feel free to contact me at 608-458-4812 or Jeff Jaeckels at 608-458-3457.

Regards,

Kathy Lipp

Kathy Lipp
Chief Environmental Officer

CC: Larry Bruss – WDNR
Maria Lauck - Nelson Dewey Generating Station
Jeff Jaeckels – Madison GO

Appendix E.3. Response from Alliant Energy – Nelson Dewey for Boiler Unit B22 (2), May 26, 2009.

Dear Mr. Loftus:

Wisconsin Power and Light Company (WPL) submits this letter in response to your e-mail received May 11, 2009.

In your correspondence you requested a sufficient explanation as to why the electrostatic precipitator (ESP) control efficiencies at Nelson Dewey Unit 2 (previously documented at 95-97.1% removal efficiency) are lower than other ESPs of which the department is aware.

The control efficiency we provided was the last documented value for this unit. We believe the control efficiency has since improved as a result of the steps taken to optimize ESP performance that are detailed in our April 20, 2009 letter to you. We have conducted particulate testing on Nelson Dewey Unit 1 since the improvements. Unit 1 was selected since it historically had the lower performance of the two units. Control efficiency was estimated by testing the particulate emissions into and out of the ESP. A number of load and ESP conditions were tested. The Unit 1 testing determined removal efficiencies varied from 98.68 to 99.36%. Unit 2 should have similar performance since the same operational enhancements were made. The improvement is evident by continuous opacity monitor readings. During the first quarter of 2007 the average 6-minute opacity reading in the stack was 5.93 percent. After improvements, the average 6-minute opacity reading for the first quarter of 2008 was 3.85 percent.

Regardless of these improvements, maximum 24-hour emissions (based on stack testing prior to the improvements) were used in the modeling analysis documenting particulate emissions from Unit 2 and were found to have had negligible impacts to visibility at Class I areas.

WPL will continue to properly maintain the Unit 2 ESP at Nelson Dewey and believes that no further measures or modifications to existing equipment could improve performance and more importantly, would not have any detectable improvements to visibility at Class I areas. WPL believes that the most prudent and effective approach to BART for PM will be to implement enforceable measures in a compliance assurance monitoring (CAM) plan, included in the facility's Title V permit, that describe how the Unit 2 ESP will be maintained to assure high control efficiency levels. This practical approach will

Appendix E.3. Response from Alliant Energy – Nelson Dewey for Boiler Unit B22 (2), May 26, 2009 (cont.).

provide more meaningful long-term results, rather than targeting the % levels and involving additional costly testing that will only provide a snapshot of information.

If you have further questions or comments please feel free to contact me at 608-458-3457.

Regards,

Jeffrey M. Jaeckels, P.E.
Senior Environmental Specialist

Appendix E.4. PM BART Analysis from Dairyland Power Coop – Alma (JP Madgett) for Boiler Unit B25 (JPM), January 5, 2009.

Dear Mr. Melby:

SUBJECT: Particulate Matter (PM) Best Available Retrofit Technology (BART) Compliance Submittal for the Dairyland Power Cooperative (DPC) John P. Madgett Boiler, FID 606034110

DPC's John P. Madgett (JPM) boiler is subject to the BART requirements as outlined in NR433, Protection of Visibility of Best Available Retrofit Technology (BART). On December 16, 2008, DPC submitted an SO_2 and NOx BART Compliance Letter as partial compliance for the JPM boiler. The following information regarding particulate matter (PM) control device is hereby submitted per your December 22, 2008 letter addressing BART control levels for PM:

- The JPM boiler controls PM emissions using a pulse-jet fabric filter (PJFF) baghouse. The baghouse is made up of 12 separate compartments each containing 1,064 bags. The manufacturer has guaranteed PM emissions to not exceed 0.015 lbs/MmBtu, excluding backhalf.
- The PJFF was constructed during 2006 and 2007 and became operational November 24, 2007. The Department determined the PJFF to be BACT for coal-fired utility boilers. PM control efficiency is approximately 99%. It would be very difficult to substantially improve the collection efficiency of the PJFF.
- PJFF inspections and maintenance are performed during scheduled plant outages. Below is a brief summary of the PJFF maintenance procedures:
  - ✓ PJFF internal compartment visual inspection for the presence of ash and any damage or corrosion
  - ✓ Check clearance of identified equipment
  - ✓ Lubrication of identified equipment
  - ✓ Check on the chain tension and condition. Clean if necessary.
- PM is monitored using opacity as a surrogate for PM. DPC has established a Continuous Assurance Monitoring (CAM) plan that formalizes the relationship between opacity and PM, and establishes an opacity level under which PM emissions would be in compliance with the PM limit.
- DPC estimates the remaining life of JPM boiler to be at least 30 years.

Appendix E.4. PM BART Analysis from Dairyland Power Coop – Alma (JP Madgett) for Boiler Unit B25 (JPM), January 5, 2009 (cont.).

The Departments July 9, 2008 BART notification letter listed one additional Alma Site source as subject to BART. B27 is the JPM Auxiliary Boiler which is a smaller emission source which has negligible impact on haze. The boiler has a heat input of 83.2 MmBtu/hr, burns only distillate oil, and has no installed control equipment. B27 operates only during boiler startup and during main steam boiler outages during cold weather. DPC believes this source currently meets BART requirements and no further BART analyses are necessary.

DPC believes this submittal fulfills your request for additional PM control device information for the JPM boiler and our compliance requirements under NR 433.

If you have any questions regarding this submittal, please contact me at (608)787-1371. Thank you for your consideration of this matter.

Sincerely,

DAIRYLAND POWER COOPERATIVE

Donald Huff
Director, Environmental Affairs

Appendix E.4. Response from Dairyland Power Coop – Alma (JP Madgett) for Boiler Unit B25 (JPM), April 15, 2009.

JPM Baghouse Particulate Removal Efficiency

All Baghouse Compartments In Service

Mass balance calculations using data from the particulate compliance test performed on December 18, 2007

Average coal feed rate: (lbs/hr)	469,494.3
Ultimate coal analysis, ash as received: (% ash)	5.30
Average stack particulate emissions: (lbs/hr)	20.964

Assume 80 percent of the total ash is fly ash.

$$\text{Ash entering the Baghouse (lbs/hr)} = \frac{469{,}494.3 \text{ lb}}{\text{hr}} \times 0.053 \times 0.8 = 19{,}906.56$$

$$\text{Baghouse efficiency (excludes condensibles)} = \frac{19{,}906.56 - 20.964}{19{,}906.56} \times 100 = 99.89$$

One Baghouse Compartment Out-of-Service

Mass balance calculations using data from the particulate compliance test performed on December 19, 2007

Average coal feed rate: (lbs/hr)	457,885.7
Ultimate coal analysis, ash as received: (% ash)	5.21
Average stack particulate emissions: (lbs/hr)	19.775

Assume 80 percent of the total ash is fly ash.

$$\text{Ash entering the Baghouse (lbs/hr)} = \frac{457{,}885.7 \text{ lb}}{\text{hr}} \times 0.0521 \times 0.8 = 19{,}084.68$$

$$\text{Baghouse efficiency (excludes condensibles)} = \frac{19{,}084.68 - 19.775}{19{,}084.68} \times 100 = 99.90$$

Appendix E.5. PM BART Analysis from Dairyland Power Coop – Genoa for Boiler Unit B20 (3), January 5, 2009.

Mr. John Melby
Wisconsin Department of Natural Resources
Bureau of Air Management
101 S. Webster
PO Box 7921
Madison, WI 53702

Dear Mr. Melby:

SUBJECT: Particulate Matter (PM) Best Available Retrofit Technology (BART) Compliance Submittal for the Dairyland Power Cooperative (DPC) Genoa-3 Boiler, FID 663020930

DPC's Genoa-3 boiler is subject to the BART requirements as outlined in NR433, Protection of Visibility of Best Available Retrofit Technology. On December 16, 2008, DPC submitted an SO_2 and NOx BART Compliance Letter as partial compliance for the Genoa-3 boiler. This letter is intended to complete our BART requirements for the Genoa-3 boiler. The following information regarding particulate matter (PM) control is hereby submitted per your December 22, 2008 letter addressing BART control levels for PM:

- The Genoa-3 boiler controls PM emissions using a pulse-jet fabric filter (PJFF) baghouse. The baghouse is made up of 10 separate compartments each containing 984 bags. In construction permit, 07-SDD-272 dated February 27, 2008, the Department determined the baghouse to be best available control technology (BACT). The construction permit establishes new PM, PM10 and opacity limits effective once the dry flue gas desulfurization system (DFGD), which is currently under construction, becomes operational. The new PM and PM10 limits are 0.034 lbs/MmBtu averaged over any 3-hour period, including backhalf; and 0.015 lbs/MmBtu averaged over any 3-hour period, excluding backhalf. The new opacity limit is 20%. It is currently anticipated that the DFGD will become operational in November or December of 2009.
- The PJFF was constructed during 2006 and 2007 and became operational May 9, 2007. As stated above, the Department determined the PJFF to be BACT. PM control efficiency is approximately 99%. It would be very difficult to substantially improve the collection efficiency of the PJFF.
- PJFF inspections and maintenance are performed during scheduled plant outages. Below is a brief summary of the PJFF maintenance procedures:
    - ✓ PJFF internal compartment visual inspection for the presence of ash and any damage or corrosion
    - ✓ Check clearance of identified equipment
    - ✓ Lubrication of identified equipment
    - ✓ Check on the chain tension and condition. Clean if necessary.
- Per the construction permit, PM is monitored using opacity as a surrogate for PM. DPC has established a Continuous Assurance Monitoring (CAM) plan that formalizes the relationship between opacity and PM, and establishes an opacity level under which PM emissions would be in compliance with the PM limit.

Appendix E.5. PM BART Analysis from Dairyland Power Coop – Genoa for Boiler Unit B20 (3), January 5, 2009 (cont.).

- DPC estimates the remaining life of the Genoa-3 boiler to be at least 25 years.

The Department's July 9, 2008 BART notification letter listed the following eight additional Genoa Site sources as subject to BART. These sources are:

B25	Auxiliary Boiler – 184.5 MmBtu/hr
B40	LACBWR Heating Boiler – 6.3 MmBtu/hr
F01	Coal Barge Unloader
F04	West Coal Stocker
F05	East Coal Stocker
F06	Coal Storage Pile
F07	Coal Pile Bulldozer Operations
P01	Air Heater/Economizer Ash Transfer System

These are smaller emissions sources which have negligible impact on haze. DPC believes these sources currently meet BART requirements and no further BART analyses are necessary.

Boilers B25 and B40 are distillate oil-fired boilers with no installed control equipment. Both of these boilers operate intermittently. B25 generally operates only during boiler startup and during main steam boiler outages during cold weather. B40 generally operates only during the heating season.

F01, F04 – F07 are fugitive coal handling operations. The site operation permit requires these sources to be operated under a fugitive dust control plan.

Source P01 is a vacuum pneumatic ash transfer system. This system moves ash from the air heater ash hopper and the economizer ash hopper to an ash silo. This system operates intermittently.

DPC believes this submittal fulfills your request for additional PM control device information for the Genoa-3 boiler and our compliance requirements under NR 433.

If you have any questions regarding this submittal, please contact me at (608)787-1371. Thank you for your consideration of this matter.

Sincerely,

DAIRYLAND POWER COOPERATIVE

Donald Huff
Director, Environmental Affairs

Appendix E.5. Response from Dairyland Power Coop – Genoa for Boiler Unit B20 (3), April 15, 2009.

Genoa #3 Baghouse Particulate Removal Efficiency

All Baghouse Compartments In Service

Mass balance calculations using data from the particulate compliance test performed on July 24, 2007

Average coal feed rate: (lbs/hr)	339,432.5
Ultimate coal analysis, ash as received: (% ash)	6.33
Average stack particulate emissions: (lbs/hr)	21.379

Assume 80 percent of the total ash is fly ash.

$$\text{Ash entering the Baghouse (lbs/hr)} = \frac{339{,}432.5 \text{ lb}}{\text{hr}} \times 0.0633 \times 0.8 = 17{,}188.86$$

$$\text{Baghouse efficiency (excludes condensibles)} = \frac{17{,}188.86 - 21.379}{17{,}188.86} \times 100 = 99.88$$

One Baghouse Compartment Out-of-Service

Mass balance calculations using data from the particulate compliance test performed on July 25, 2007

Average coal feed rate: (lbs/hr)	338,850.6
Ultimate coal analysis, ash as received: (% ash)	5.74
Average stack particulate emissions: (lbs/hr)	21.492

Assume 80 percent of the total ash is fly ash.

$$\text{Ash entering the Baghouse (lbs/hr)} = \frac{338{,}850.6 \text{ lb}}{\text{hr}} \times 0.0574 \times 0.8 = 15{,}560.02$$

$$\text{Baghouse efficiency (excludes condensibles)} = \frac{15{,}560.02 - 21.492}{15{,}560.02} \times 100 = 99.86$$

Appendix E.6. PM BART Analysis from We Energies – Oak Creek for Boiler Units B27 (7) and B28 (8), February 23, 2009.

Dear Mr. Melby:

Wisconsin Electric Power Company, doing business as We Energies, is submitting this Best Available Retrofit Technology (BART) analysis for particulate matter (PM) at Units 7 and 8 of the company's Oak Creek Power Plant (OCPP) in Milwaukee County. This submittal is in response to the specific information requests within your letter of December 22, 2008 and in accordance with Wis. Admin. Code § NR 433.04(1).

We understand from your letter of December 22, 2008 that the Department conducted an evaluation of sources like Oak Creek Power Plant with high efficiency PM control such as an ESP and "found that the visibility improvement resulting from reduction in PM emissions is not significant and does not warrant consideration of additional PM controls." Furthermore, the Department's evaluation indicated that "there would be no significant visibility improvement with additional PM controls" and that "the cost of incremental visibility improvement would appear to be high for additional PM control." The letter also stated that "DNR believes that sources with high efficiency PM controls such as a baghouse or an ESP meet a BART level of control technology."

However, despite this analysis, we understand that the Department believes that facilities are still required to provide a PM submittal for BART, and you have asked that We Energies provide an abbreviated PM BART submittal for the Oak Creek Power Plant. We are therefore responding to the specific information requirements identified in your December 22, 2008 letter.

Background

Located in the city of Oak Creek, Oak Creek Power Plant Units 7 and 8 began operation in 1965 and 1967, respectively, and generate approximately 612 megawatts of electricity. These units are part of We Energies baseload capacity. As outlined below, significant environmental investments are being made to these two units, and they will continue to be a key component of the state's electrical system.

Appendix E.6. PM BART Analysis from We Energies – Oak Creek for Boiler Units B27 (7) and B28 (8), February 23, 2009 (cont.).

Description of PM Control Equipment and Installation Dates

Unit 7 and 8 were originally placed in service with electrostatic precipitators (ESPs) to control PM. The original ESPs on Units 7 and 8 were replaced with new ESPs in 1992 and 1991, respectively. The new ESPs included larger collection surfaces, new controls and upgrades to the power supply. Since that time the ESPs have been continually maintained.

Additional PM control will also be realized by environmental improvements currently being installed at the plant as part of an $830 million air quality control system. This includes a wet flue gas desulfurization system (FGD) being installed for units 7 and 8. This new system will provide PM control through two mechanisms. Located downstream of the ESPs, the water-based scrubbing system provides a secondary means of reducing direct particulate emissions in the flue gas exiting the units' chimney. Additionally, by significantly removing sulfur compound emissions from the units, the FGD reduces the subsequent formation of sulfuric acid mist (SAM) in the atmosphere, thereby reducing this potential contribution to visibility impairing materials. The FGD is currently under construction and will be operational before December 31, 2012, or in advance of the 2013 date contained in NR 433.05(1).

PM Equipment Efficiency

The removal efficiency of the plant's ESPs is 99.92 and 99.77 percent as measured by the most recent emissions tests performed on Units 7 and 8, respectively. The PM control efficiency of the ESPs has been improved (as cited above) with the installation of the new ESPs. These upgrades, combined with the plant's operating and maintenance practices, optimize the efficiency of these devices. Furthermore, our Consent Decree with the U.S. Environmental Protection Agency requires the company to "continuously operate each particulate matter control device on its existing units to maximize PM emission reductions, consistent with operational and maintenance limitations of the units." The Decree also requires that the plant, "maintain the energy or power levels delivered to the ESPs for each unit to achieve the greatest possible removal of PM."

Neither the ESPs nor the new wet FGD's PM emissions control efficiencies could be improved without modifying the equipment configuration currently being installed. Based on the measured particulate matter removal efficiency of the wet FGD at Pleasant Prairie Power Plant, we expect the new FGD for Units 7 and 8 at Oak Creek to achieve a PM removal rate in the range of 50 to 70 percent of the PM entering the scrubber. Therefore, upgrading the existing ESP would have little, if any, impact on the PM emission rate. (The SCRs and FGDs currently being installed at the Oak Creek Power Plant are part of an $830 million air quality control system (AQCS) project authorized by a construction permit issued by the Department.)

Maintenance Procedures

The plant utilizes several plant-specific maintenance procedures to assure continued performance of the ESPs and monitoring systems, and additional procedures are being developed with the installation of the FGD cited above. These procedures include but are not limited to the following:

- Malfunction Prevention and Abatement Plan (MPAP)
- ESP and FGD (future) maintenance procedures, as well as an ESP unusual operations procedure
- Continuous Emissions Monitoring Systems (CEMS) maintenance procedures, plus shutdown, breakdown or malfunction reporting.

Appendix E.6. PM BART Analysis from We Energies – Oak Creek for Boiler Units B27 (7) and B28 (8), February 23, 2009 (cont.)

These procedures are maintained by the plant in conjunction with We Energies Environmental Department, and are periodically reviewed and updated due to changes in operations, equipment, or regulatory requirements.

PM Emission Monitoring

Common stack 4, which serves Units 7 and 8, has opacity limits as outlined in the plant's Title V renewable operating permit, and a certified continuous opacity monitoring system (COMS) is located on this stack. Maintenance and operation of this system are in accordance to the quality assurance/quality control (QA/QC) plans maintained by the company. In addition, an updated Compliance Assurance Monitoring (CAM) plan is currently being included into the Title V operating permit. To assist in operation of the plant, non-certified COMS are also located on the duct of each unit. We Energies has also installed data collection PM monitoring systems on the ESP outlet ducts of Units 7 and 8 as part of a research activity under the terms of the consent decree referenced above.

Remaining Useful Life of Unit

Neither We Energies nor the Public Service Commission of Wisconsin (PSCW) has estimated the remaining useful life of OCPP Units 7 and 8. We Energies applies two criteria for the continued operation of a generating facility: economic viability and reliability impacts of retirement. Because of the operating efficiency, environmental performance, and contribution to We Energies system capacity, it is expected the Oak Creek Power Plant units will remain operational for the foreseeable future.

Please do not hesitate to contact me at (414) 221-4872 or at brian.borofka@we-energies.com if you require additional information.

Sincerely,

Brian Borofka
Environmental - Air Quality Team

Appendix E.7. PM BART Analysis from We Energies – Pleasant Prairie for Boiler Units B21 (1) and B22 (2), February 23, 2009.

Dear Mr. Melby:

Wisconsin Electric Power Company, doing business as We Energies, is submitting this Best Available Retrofit Technology (BART) analysis for particulate matter (PM) at the company's Pleasant Prairie Power Plant (P4) in Kenosha County. This submittal is in response to the specific information requests within your letter of December 22, 2008 and in accordance with Wis. Admin. Code § NR 433.04(1).

We understand from your letter of December 22, 2008 that the Department conducted an evaluation of sources like Pleasant Prairie Power Plant with high efficiency PM control such as an electrostatic precipitator (ESP) and "found that the visibility improvement resulting from reduction in PM emissions is not significant and does not warrant consideration of additional PM controls." Furthermore, the Department's evaluation indicated that "there would be no significant visibility improvement with additional PM controls" and that "the cost of incremental visibility improvement would appear to be high for additional PM control." The letter also stated that "DNR believes that sources with high efficiency PM controls such as a baghouse or an ESP meet a BART level of control technology."

However, despite this analysis, we understand that the Department believes that facilities are still required to provide a PM submittal for BART, and you have asked that We Energies provide an abbreviated PM BART submittal for the Pleasant Prairie Power Plant. We are therefore responding to the specific information requirements identified in your December 22, 2008 letter.

Background

The Pleasant Prairie Power Plant, located in the Village of Pleasant Prairie, is the largest generating plant in the state of Wisconsin. This base-load plant operates almost continuously and was designed to burn low-sulfur western sub-bituminous coals to reduce sulfur dioxide emissions. The plant's two units produce a combined total of 1,210 megawatts of electricity. The two units were the first major electric generating units in Wisconsin to install advanced state-of-the art air quality control systems to significantly reduce sulfur dioxide and nitrogen oxide emissions, with co-benefits of PM emission reductions.

Appendix E.7. PM BART Analysis from We Energies – Pleasant Prairie for Boiler Units B21 (1) and B22 (2), February 23, 2009 (cont.).

Description of PM Control Equipment and Installation Dates

Units 1 and 2 were originally placed into service in 1980 and 1985, respectively, with electrostatic precipitators (ESPs) to control PM. New automatic voltage and rapper/vibrator controllers were installed during 2000-2001. These improvements provide the plant operators the ability to digitally program and better control how the ESP plates are rapped and the wires vibrated in order to optimize PM collection efficiency.

Additional PM control was achieved with the more recent installation of wet flue gas desulfurization (FGD) systems on both units. The FGD on Unit 1 became operational in November 2006, and Unit 2 in March 2007. These systems provide PM control through two mechanisms. Located downstream of the ESPs, the water-based scrubbing system provides a secondary means of reducing direct PM emissions in the flue gas exiting the plant's chimneys. Additionally, by significantly removing sulfur compound emissions from the units, the FGD reduces the subsequent formation of sulfuric acid mist (SAM) in the atmosphere, thereby reducing this potential contribution to visibility impairing materials.

PM Equipment Efficiency

The removal efficiency of the plant's ESPs is 99.91 and 99.75 percent as measured by the most recent emissions tests performed on Units 1 and 2, respectively. The PM control efficiency of the ESPs has been improved (as cited above) with the installation of the new digital control systems earlier in this decade. These controls, combined with the plant's operating and maintenance practices, optimize the efficiency of these devices. Furthermore, our Consent Decree with the U.S. Environmental Protection Agency requires the company to "continuously operate each particulate matter control device on its existing units to maximize PM emission reductions, consistent with operational and maintenance limitations of the units." The Decree also requires that the plant, "maintain the energy or power levels delivered to the ESPs for each unit to achieve the greatest possible removal of PM."

The measured particulate matter removal efficiency of the wet FGD downstream of the ESP ranges from 50 to 70 percent removal of the PM entering the scrubber.

Neither the ESPs nor the more recently installed wet FGDs PM control efficiencies can be improved without modifying the existing equipment configuration. The ESPs are located downstream of the newly installed selective catalytic reduction (SCR) units and upstream of the FGDs. Any modification of the ESPs would involve reconfiguring these two adjacent systems, as well as ID (induced draft) and booster fans and ductwork. (The SCRs and FGDs were installed as part of a $325+ million air quality control system (AQCS) project installed under a construction permit issued by the Department.)

Maintenance Procedures

The plant utilizes several plant-specific maintenance procedures to assure continued performance of the ESPs, FGD and monitoring systems. These include but are not limited to the following:

- Malfunction Prevention and Abatement Plan (MPAP)
- ESP and FGD maintenance procedures, as well as an ESP unusual operations procedure
- Continuous Emissions Monitoring Systems (CEMS) maintenance procedures, plus shutdown, breakdown or malfunction reporting.

Appendix E.7. PM BART Analysis from We Energies – Pleasant Prairie for Boiler Units B21 (1) and B22 (2), February 23, 2009 (cont.).

These procedures are maintained by the plant in conjunction with We Energies Environmental Department, and are periodically reviewed and updated due to changes in operations, equipment, or regulatory requirements.

PM Related Emission Monitoring

Units 1 and 2 have opacity limits as outlined in the plant's Title V renewable operating permit, and continuous opacity monitoring systems (COMS) are maintained in the ducts exiting both units. Maintenance and operation of these systems are in accordance to the quality assurance/quality control (QA/QC) plans maintained by the company. In addition an updated Compliance Assurance Monitoring (CAM) plan is currently being developed for inclusion into the Title V operating permit. We Energies has also installed data collection PM monitoring systems on both units as part of a research activity under the terms of the Consent Decree referenced above.

Remaining Useful Life of Unit

Neither We Energies nor the Public Service Commission of Wisconsin (PSCW) has estimated the remaining useful life of P4. We Energies applies two criteria for the continued operation of a generating facility: economic viability and reliability impacts of retirement. Because of the operating efficiency, environmental performance, and contribution to We Energies system capacity, it is expected that P4 will remain operational for the foreseeable future.

Please do not hesitate to contact me at (414) 221-4872 or at brian.borofka@we-energies.com if you require additional information.

Sincerely,

Brian Borofka
Environmental - Air Quality Team

Appendix E.8. PM BART Analysis from We Energies – Valley for Boiler Units B21, B22, B23 and B24, February 23, 2009.

Dear Mr. Melby:

Wisconsin Electric Power Company, doing business as We Energies, is submitting this Best Available Retrofit Technology (BART) analysis for particulate matter (PM) at the company's Valley Power Plant (VAPP) in Milwaukee. This submittal is in response to the specific information requests within your letter of December 22, 2008 and in accordance with Wis. Admin. Code § NR 433.04(1).

We understand from your letter of December 22, 2008 that the Department conducted an evaluation of sources like Valley Power Plant with high efficiency PM control such as a baghouse and "found that the visibility improvement resulting from reduction in PM emissions is not significant and does not warrant consideration of additional PM controls." Furthermore, the Department's evaluation indicated that "there would be no significant visibility improvement with additional PM controls" and that "the cost of incremental visibility improvement would appear to be high for additional PM control." The letter also stated that "DNR believes that sources with high efficiency PM controls such as a baghouse or an ESP meet a BART level of control technology."

However, despite this analysis, we understand that the Department believes that facilities are still required to provide a PM submittal for BART, and you have asked that We Energies provide an abbreviated PM BART submittal for the Valley Power Plant. We are therefore responding to the specific information requirements identified in your December 22, 2008 letter.

Background

Valley Power Plant is the largest co-generation facility in the country and generates both electricity and steam. The plant generates steam for approximately 350 customers in the downtown area of Milwaukee that include city and county government complexes, Marquette University, a hospital, Rockwell Automation and numerous other major businesses. It also produces about 3-4 percent of the We Energies system electric energy. The plant has two units, each of which has two coal-fueled boilers and a single turbine generator capable of generating 140MW of electricity. Peak steam demand has exceeded 1,000,000 lbs/hour.

Appendix E.8. PM BART Analysis from We Energies – Valley for Boiler Units B21, B22, B23 and B24, February 23, 2009 (cont.).

Description of PM Control Equipment and Installation Dates

Unit 1 and 2 were originally placed in service in 1968 and 1969, respectively, with electrostatic precipitators (ESPs) to control PM. In 1994 and 1995 the existing ESPs were replaced with reverse air fabric filter baghouse (BH) systems. These BH systems are maintained with routine replacement of the bag filters.

PM Equipment Efficiency

The removal efficiency of the baghouse systems is approximately 99.94 percent as measured by the most recent emissions tests performed on the units. The baghouses are continually monitored for their performance. This monitoring, combined with the plant's operating and maintenance practices, optimize the efficiency of these devices. Furthermore, our Consent Decree with the U.S. Environmental Protection Agency requires the company to "continuously operate each particulate matter control device on its existing units to maximize PM emission reductions, consistent with operational and maintenance limitations of the units." The Decree also requires that the plant, "maintain an on-going bag leak detection and replacement program to assure optimal operation of each BH."

The operation and control efficiencies of the baghouse units can not be improved without significant modifications to the existing equipment and site configuration. When the BHs were installed in the mid 1990s, the coal storage area and other plant facilities had to be re-configured, including reducing the coal storage capacity at the plant. Furthermore, the Valley Power Plant is located in Milwaukee's Menomonee Valley, and is constrained by I-94 on the east, the Menomonee River channels on the north and south, and adjacent industry on the west.

Maintenance Procedures

The plant utilizes several plant-specific maintenance procedures to assure continued performance of the BHs and monitoring systems. These include but are not limited to the following:

- Malfunction Prevention and Abatement Plan (MPAP)
- Baghouse maintenance procedures, as well as an unusual operations procedure
- Continuous Emissions Monitoring Systems (CEMS) maintenance procedures, plus shutdown, breakdown or malfunction reporting.

These procedures are maintained by the plant in conjunction with We Energies Environmental Department, and are periodically reviewed and updated due to changes in operations, equipment, or regulatory requirements.

PM Emission Monitoring

Units 1 and 2 have opacity limits as outlined in the plant's Title V renewable operating permit and continuous opacity monitoring systems (COMS) are maintained in the flues exiting both units. Maintenance and operation of these systems are in accordance to the quality assurance/quality control (QA/QC) plans maintained by the company. In addition, a PM Compliance Assurance Monitoring (CAM) plan in addressed in the plant's Title V operating permit. We Energies also utilizes the existing COMS as a data collection PM monitor on Unit 1 as part of a research activity under the terms of the Consent Decree referenced above.

Appendix E.8. PM BART Analysis from We Energies – Valley for Boiler Units B21, B22, B23 and B24, February 23, 2009 (cont.).

Remaining Useful Life of Unit

Neither We Energies nor the Public Service Commission of Wisconsin (PSCW) has estimated the remaining useful life of VAPP. We Energies applies two criteria for the continued operation of a generating facility: economic viability and reliability impacts of retirement. Because of the operating efficiency, environmental performance, and critical role in providing a low-cost steam supply to over 350 customers in downtown Milwaukee, it is expected the VAPP will remain operational for the foreseeable future.

Please do not hesitate to contact me at (414) 221-4872 or at brian.borofka@we-energies.com if you require additional information.

Sincerely,

Brian Borofka
Environmental - Air Quality Team

Appendix E.9. PM BART Analysis from Wisconsin Public Service Corporation – Pulliam for Boiler Unit B27 (8), January 2, 2009.

PURPOSE

Consistent with guidance provided by the Wisconsin Department of Natural Resources by letter of December 22, 2008, the following information documents compliance with the provisions of NR 433 for the Wisconsin Public Service Corporation J.P. Pulliam Unit 8 boiler. This analysis is limited to the potential for visibility impacts due to particulate matter (PM) emissions as identified in NR 433.05(1)(e).

DESCRIPTION OF PM CONTROL EQUIPMENT

Unit 8 utilizes an electrostatic precipitator (ESP) device for PM collection. This ESP is a highly efficient filtration device that removes emissions from the coal-fired combustion process that is composed primarily of inorganic ash residues and contaminants in the fuel. This is accomplished by minimally impeding the flow of gas through the device and using the force of an induced electrostatic charge to collect the particulate matter in the flue gas.

INSTALLATION DATE OF THE EQUIPMENT

The ESP on Unit 8 was rebuilt by Epscon-FLS (FLSmidth/Airtech) and placed into service in the spring of 1994. The ESP performance guarantee, at the operating design conditions, is to collect 99.8% of the particulates entering the unit.

POSSIBLITY OF INCREASED PM CONTROL WITHOUT EQUIPMENT MODIFICATION

As noted, the ESP for Unit 8 was rebuilt in 1994 to improve performance. Without significant ESP expansion or configuration changes, the control efficiency of this unit would not be improved.

MAINTENANCE PROCEDURES FOR THIS EQUIPMENT

The ESP on Unit 8 is routinely inspected and maintained to ensure that it is operating properly. The inspections are performed in accordance with the plant Malfunction Prevention and Abatement Plan, and include the following: 1) thrice daily inspections of the electrical operating parameters, 2) weekday inspections of ESP controls, 3) weekly inspection of the precipitator rappers and hopper vibrators, and 4) a complete internal inspection of all areas of the precipitator during planned maintenance outages (~18 month intervals). The results of each listed inspection are documented, and any identified problems are addressed through the plant work management system. Instrumentation used to monitor the precipitator performance is calibrated on an annual basis, and sufficient spare parts are stocked on site to facilitate most repairs.

DESCRIPTION OF PM RELATED EMISSION MONITORING

Compliance emission testing, or stack tests, are required by air pollution control operation permit and NR 439.075, Wis. Adm. Code, to be conducted biennially. Stack tests performed by WPSC have demonstrated particulate matter emissions of less than 50% of the permit limit of 0.30 lbs/MMBtu of heat input. Therefore, in accordance with the exception allowed under NR

Appendix E.9. PM BART Analysis from Wisconsin Public Service Corporation – Pulliam for Boiler Unit B27 (8), January 2, 2009 (cont.).

439.075(4)(a)1.b., WPSC has requested and received waivers from the Department allowing stack tests to be performed once every four years. The stack tests were performed in accordance with Method 5 and Method 202 to determine the total PM emission rate. The total PM emission rate from stack tests performed in 2000, 2004, and 2008 for Unit 8 ranged from 0.0341 to 0.066 lbs/MMBtu.

REMAINING USEFUL LIFE OF THE BART UNIT

WPSC has not established a replacement date for the J.P. Pulliam Plant Unit 8 boiler. Maintenance practices have been established which allow for continued operation of this unit. An economic evaluation is conducted when major expenditures are contemplated to maintain unit performance or to meet new laws or regulations. A twenty year evaluation period is utilized to evaluate the impact to WPSC rate payers.

Conclusion

Slightly greater particulate matter control could be obtained by installing a fabric filter (FF). However, the significant capital cost of a FF coupled with negligible modeled visibility improvement at Class I areas resulting from slightly reduced PM emissions would not warrant further consideration of a FF for controlling PM emissions. Therefore, the existing electrostatic precipitators are considered to be the Best Available Retrofit Technology for J.P. Pulliam Unit 8.

Appendix E.9. Response from Wisconsin Public Service Corporation – Pulliam for Boiler Unit B27 (8), March 10, 2009.

Dear Mr. Loftus:

Response to request for additional BART information – J.P. Pulliam Unit #8 (Unit 8)

References:
1) Letter to R. Oswald from J. Melby (WDNR) dated December 22, 2008 regarding BART Control levels for Particulate Matter
2) Letter to Mr. J. Melby from Mr. H. Giesler dated January 2, 2009 – Particulate Matter BART compliance demonstration for J.P. Pulliam Unit 8
3) Email to R. Oswald from J. Loftus (WDNR) dated February 5, 2009

As requested in Reference 3, Wisconsin Public Service Corporation (WPSC) is providing additional information in support of the position that the current particulate matter (PM) control technology on Unit 8 meets the definition of Best Available Control Technology (BART). Specifically requested was additional information in support of the WPSC conclusion that additional PM control would result in "significant capital cost" expenditures. WPSC was also requested to identify any potential improvements that could be achieved in PM control efficiency without modification of the existing equipment configuration.

Background

In Reference 1 the WDNR provided guidance on the information needed to demonstrate compliance with the Wisconsin BART rule and what particulate matter controls are consistent with BART. Reference 1 also discussed a WDNR evaluation in which it determined that the visibility improvements resulting from reductions in PM emissions is not significant and does not warrant consideration of additional operating or maintenance controls. Finally, the letter also stated that sources with high efficiency PM controls such as a baghouse or an Electrostatic Precipitator (ESP) meet a BART level of control technology.

Appendix E.9. Response from Wisconsin Public Service Corporation – Pulliam for Boiler Unit B27 (8), March 10, 2009 (cont.).

Equipment Modifications

Reference 2 identified Pulliam Unit 8 as being equipped with a high efficiency ESP. This ESP achieves approximately 99.8% PM collection efficiency as a result of equipment design, good maintenance practices, and incremental modifications implemented prior to and following the reconstruction of the equipment in 1994. Based on equipment inspections, current performance, and engineering studies WPSC has concluded that there are no additional incremental ESP modifications that would result in any substantive improvement in collection efficiency. Since the mid 1980's modifications have been made to optimize the ESP performance. These modifications include:

a. In 1988 flue gas conditioning (SO3 injection) was installed to decreases the resistivity of fly ash produced from the combustion of low sulfur coals. Decreased resistivity improves ESP collection efficiency. In 2000 this system was modified to a dry sulfur pellet system to increase the reliability and safety of the system.

b. In 1994 the Pulliam Unit 8 ESP was completely reconstructed with new internal equipment and controls.

c. In 1997 new precipitator control equipment was installed on the unit. In 2007 this equipment was upgraded to the A.V.C. PowerCon 800 voltage control equipment. The latest upgraded control equipment is designed to manage ESP efficiency by controlling the magnitude of voltage on the primary winding of the Transformer Rectifier (TR) Sets. In addition to voltage control, the PowerCon 800 equipment provides WPSC with a common platform to network equipment monitoring for ESP performance and data collection.

d. In 2000 water wash modifications were installed to facilitate the washing of the ESPs on a periodic basis. Washing of the ESPs removes a built up thin layer of ash that collects on ESP discharge electrodes. This ash layer reduces the power output of the TR sets over time and thereby reduces the overall collection efficiency of the ESP. The TR Sets are the high voltage transformers and rectifiers that provide the electrical energy for a given precipitator area. In 2006 additional modifications to this system were made consisting of custom fabricated water troughs, water supply piping, and discharge piping for water and ash disposal.

e. In 2008 the primary coal crushers were replaced to obtain a more uniform coal size following plant changeover to low sulfur fuels. The new coal crushers are now sized for the current coal flow rates. Proper sizing of the coal crushers reduces non-uniform coal, which contributes to erratic coal combustion. Erratic coal combustion can lead to opacity excursions as a result of non-steady state ESP operation.

In addition to these improvements, evaluations were completed to determine if other ESP configuration changes would effectively improve ESP performance. The evaluated improvements included modifications to rapper equipment, controls and the sequencing of the rappers. These evaluations determined that negligible efficiency improvement would result from these projects. Finally, an ammonia injection system costing over a million dollars was

Appendix E.9. Response from Wisconsin Public Service Corporation – Pulliam for Boiler Unit B27 (8), March 10, 2009 (cont.).

evaluated. Ammonia injection was considered because it improves the cohesiveness of the dust layer formed on the collecting plates and typically results in less fly ash re-entrainment when the plates are rapped. However, for a number of concerns including personnel safety in handling the ammonia, was not implemented. Therefore, based on the significant capital costs for the modifications already installed along with the additional evaluations conducted, WPSC does not believe PM control efficiency can be improved.

<u>WDNR Evaluation</u>

As stated in Reference 1, the WDNR has evaluated the extent of visibility improvement that can be achieved by reducing PM emissions and concluded that visibility improvement resulting from the reduction in PM emission is not significant. The evaluation also concluded that consideration of additional PM controls is not warranted. Finally, modeling performed by the WDNR also concludes that PM emissions are not a substantial contributor to regional haze in regional Class 1 areas.

<u>Unit 8 Remaining Useful Life</u>

Reference 3 requested information regarding the remaining life of Unit 8. WPSC does not establish replacement dates for existing generating units but rather, utilizes maintenance practices which allow for continued operation of the units. There is no known physical limitation that can be used to determine an exact replacement date for a generating unit. Instead, major capital investments, large increases in operating cost or large decreases in market price can result in unfavorable long term generating unit economics and trigger an event that could lead to generating unit replacement. Economic evaluations are conducted whenever major expenditures are contemplated to meet new laws or regulations. The results of any economic evaluation have to be interpreted in the context of how the ratepayer's electric resource portfolio risk would change should the decision be made to replace a generating unit at some point in the future.

In conclusion, modifications have already been installed to improve ESP performance. Evaluations performed to date have concluded that visibility improvement resulting from the reduction in PM emission is not significant. Finally, WPSC has determined that further ESP configuration changes will result in no significant PM collection efficiency improvements.

If you have any questions regarding this letter, please contact Mr. Randal G. Oswald at (920) 433-1395.

Sincerely,

Howard R. Giesler
Assistant Vice President – Energy Supply Operations

Appendix E.9. Response from Wisconsin Public Service Corporation – Pulliam for Boiler Unit B27 (8), April 28, 2009.

Dear Mr. Loftus:

Response to request for additional BART information – J.P. Pulliam Unit #8 (Unit 8)

References: 1) Email to Mr. R. Oswald (WPSC) from Mr. J. Loftus (WDNR) dated April 8, 2009
2) Letter to Mr. J. Melby from Mr. H. Giesler dated March 10, 2009

In reference 1, WDNR requested WPSC to provide additional information in support of its position that the current particulate matter (PM) control technology on Unit 8 meets the definition of Best Available Control Technology (BART). The following information supplements the information previously submitted in reference 2.

Question 1 – Clarification of Terms

Reference 2 includes details of the options evaluated for improving Electrostatic Precipitator (ESP) performance. Based on these evaluations WPSC has concluded that minimal incremental particulate matter control efficiency gains would be realized. WPSC expects incremental efficiency gains to be less than 0.05%.

Question 2 – Remaining Useful Lifetime of the Unit

As previously noted in reference 2, WPSC does not establish replacement dates for its existing generating units, but rather considers the economic viability of existing units in response to major capital investments, large increases in operating cost or large decreases in market energy prices. WPSC's economic analysis assumes full recovery of a major capital investment in a unit, including those for emission controls, during the unit operating life. For these reasons, WDNR's

Appendix E.9. Response from Wisconsin Public Service Corporation – Pulliam for Boiler Unit B27 (8), April 28, 2009 (cont.).

assumption that the remaining life of a retrofit control unit is at least as long as the amortization period of the control is appropriate. If and when a replacement date would be established for a generating unit, WPSC would set the amortization for any new capital investment to be within the established date of replacement.

If you have any questions regarding this letter, please contact Mr. Randal G. Oswald at (920) 433-1395.

Sincerely,

Howard R. Giesler
Assistant Vice President – Energy Supply Operations