Prevention of Significant Deterioration

Air Pollution Control Construction Permit Application

Appendix C.
Control Technology Review.

Best Available Control Technology (BACT) Analysis for the Balance of Plant Equipment, including Material Handling Systems, Cooling Towers, and Emergency Diesel Feed Water Pump.

50 MW Biomass-Fired Cogeneration Facility to be Located at the Domtar – Rothschild Mill.

March, 2010

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Executive Summary

This document is a Control Technology Review for the balance of plant equipment, including material handling equipment and processes, cooling towers, and an emergency diesel engine-driven feed water pump for We Energies' 50 MW Biomass Fuels Cogeneration Facility to be located at the Domtar – Rothschild Mill. This control technology review is required for major new sources under the Prevention of Significant Deterioration (PSD) program under NR 405.08, Wis. Adm. Code. This Project will involve the installation of a one new biomass-fired boiler and two new natural gas-fired package boilers. To support these new boilers, the Plant will require new biomass fuel handling equipment, biomass boiler ash handling equipment, a new cooling tower, and a new diesel engine driven feed water pump. These new emission units are summarized in Table ES-1. The proposed control technologies and emission limits representing the best available control technology (BACT) for these processes and emission units are summarized in Table ES-2.

TABLE ES-1. List of new material handling, cooling towers, diesel engine, and balance of plant emission units.

Stack ID	Process ID	Description
S121	P121	Biomass Fuels Unloading, Screening, Hogging, and Conveying Dust Collector
S122	F122	Self Unloading Truck Biomass Fuels Unloading
S123	F123	Biomass Fuels Storage and Reclaim
S124	P124	Boilerhouse Fuel Storage Silos
S125	F125	Biomass Fuels Delivery Truck Haul Roads
S131	P131	CFB Boiler Bed Material Silo
S132	P132	CFB Boiler Ash Silo
S133	F133	Boiler Ash Haul Roads
S141	P141	Cooling Tower
S151	P151	Emergency Diesel Engine Feed Water Pump

TABLE ES-2. Proposed control technologies and emission limits representing BACT for We Energies' 50 MW Biomass Fuels Cogeneration Facility balance of plant equipment.

Process ID	Description	Proposed BACT Requirements
P121	Biomass Fuels Unloading, Screening, Hogging, and Conveying Dust Collector	(1) PM emissions shall be controlled using buildings or enclosures combined with dust collection systems or wet dust suppression systems as BACT. (2) PM/PM_{10} emissions shall be limited to 0.004 gr/dscf. (3) $PM_{2.5}$ emissions shall be limited to 0.002 gr/dscf.
F122	Self Unloading Truck Biomass Fuels Unloading	(1) PM/PM_{10}, and $PM_{2.5}$ emissions shall be controlled using self unloading trucks in combination with a wet dust suppression system as BACT.
F123	Biomass Fuels Storage and Reclaim	(1) Particulate matter (PM), PM_{10}, and $PM_{2.5}$ emissions shall be controlled using a biomass fuels storage building designed to enclose the entire storage pile and the reclaim activities as BACT.
P124	Boilerhouse Fuel Storage Silos	(1) PM, PM_{10}, and $PM_{2.5}$ emissions shall be controlled using a bin vent filter as BACT. (2) PM/PM_{10} emissions shall be limited to 0.004 gr/dscf. (3) $PM_{2.5}$ emissions shall be limited to 0.002 gr/dscf.
P131	CFB Boiler Bed Material Silo	
P132	CFB Boiler Ash Silo	
F125	Biomass Fuels Delivery Truck Haul Roads	(1) PM, PM_{10}, and $PM_{2.5}$ emissions shall be controlled using paved roadways in combination with a dust suppression system as BACT.
F133	Boiler Ash Haul Roads	
P141	Cooling Tower	(1) PM, PM_{10}, and $PM_{2.5}$ emissions from the mechanical draft cooling tower, Process P141, shall be controlled using high efficiency drift eliminators as BACT. (2) The cooling tower drift eliminators shall be designed for a drift loss of no more than 0.0005%.
P151	Emergency Diesel Engine Feed Water Pump	(1) The diesel feed water pump shall comply with the applicable NSPS in 40 CFR § 60.4205 as BACT. (2) The diesel fuel may not exceed 0.0015% sulfur. (3) The diesel feed water pump may not be operated more than 100 hours in any 12-month period.

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Chapter 1. Introduction and Sources Evaluated.

This document is a Control Technology Review for the balance of plant equipment, including material handling equipment and processes, cooling towers, and an emergency diesel engine-driven feed water pump for We Energies' 50 MW Biomass Fuels Cogeneration Facility to be located at the Domtar – Rothschild Mill. This control technology review is required for major new sources under the Prevention of Significant Deterioration (PSD) program under NR 405.08, Wis. Adm. Code.

We Energies' 50 MW Biomass Fuels Cogeneration Facility will be a combined heat and power facility that produce 50 MW of electric power and will also provide process steam to the Domtar Mill. The Project will involve the installation of one new biomass-fired boiler, and two new natural gas-fired package boilers. To support these new boilers, the Plant will require new biomass fuel handling equipment, biomass boiler ash handling equipment, a new cooling tower, and a new diesel engine driven emergency feed water pump. A list of these new emission units is included in Table 1-1.

TABLE 1-1. List of new material handling, cooling towers, and diesel engine emission units.

Stack ID	Process ID	Description
S121	P121	Biomass Fuels Unloading, Screening, Hogging, and Conveying Dust Collector
S122	F122	Self Unloading Truck Biomass Fuels Unloading
S123	F123	Biomass Fuels Storage and Reclaim
S124	P124	Boilerhouse Fuel Storage Silos
S125	F125	Biomass Fuels Delivery Truck Haul Roads
S131	P131	CFB Boiler Bed Material Silo
S132	P132	CFB Boiler Ash Silo
S133	F133	Boiler Ash Haul Roads
S141	P141	Cooling Tower
S151	P151	Emergency Diesel Engine Feed Water Pump

Chapter 2. Control Technology Review Methodology.

2.1 Best Available Control Technology Definition.

The Clean Air Act and the Prevention of Significant Deterioration (PSD) rules in the Code of Federal regulations, 40 CFR 52.21(b)(12) define "best available control technology" (BACT) as:

> "…an emission limitation based on the maximum degree of reduction for each pollutant subject to regulation under this Act which would be emitted from any proposed major stationary source or major modification which the administrator on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes and available methods, systems, and techniques, including fuel cleaning or treatment of innovative fuel combustion techniques for control of each such pollutant. In no event shall application of BACT result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61."

In Wisconsin, BACT is defined as:

> …means an emissions limitation, including a visible emissions standard, based on the maximum degree of reduction for each air contaminant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the department, on a case-by-case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including clean fuels, fuel cleaning or treatment or innovative fuel combination techniques for control of the air contaminant. In no event may application of best available control technology result in emissions of any air contaminant which would exceed the emissions allowed by any applicable standard under chs. NR 440 and 445 to 449 and under sections 111 and 112 of the Act (42 USC 7411 and 7412). Emissions from any source utilizing clean fuels or any other means to comply with this subsection may not be allowed to increase above the levels that would have been required under this subsection as it existed prior to enactment of the 1990 clean air Act amendments on November 15, 1990. If the department determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. The standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.
> (NR 405.02(7), Wis. Adm. Code)

The BACT requirement applies for a given pollutant to each individual new or modified emission unit when the project, on a facility-wide basis, has a significant net emissions increase for that pollutant.

Individual BACT determinations are performed on a unit-by-unit, pollutant-by-pollutant basis. This BACT analysis considers potential controls for SO_2, NO_x, PM_{10}, CO, and sulfuric acid mist (SAM).

2.2 Top Down BACT Methodology.

The U.S. EPA recommends a "top-down" approach in conducting a BACT analysis. This method evaluates progressively less stringent control technologies until a level of control considered BACT is reached, based on the environmental, energy, and economic impacts. The top-down method was used in this analysis. The five steps of a top-down BACT analysis are:

1. Identify all available control technologies with practical potential for application to the emission unit and regulated pollutant under evaluation;
2. Eliminate all technically infeasible control technologies;
3. Rank remaining control technologies by effectiveness and tabulate a control hierarchy;
4. Evaluate most effective controls and document results; and
5. Select BACT, which will be the most effective practical option not rejected, based on economic, environmental, and/or energy impacts.

The impact analysis of any BACT review includes an evaluation of environmental, energy, technical, and economic impacts. The net environmental impact associated with a control alternative may be considered if dispersion modeling analyses are performed. The energy impact analysis estimates the direct energy impacts of the control alternatives in units of energy consumption. If possible, the energy requirements for each control option are assessed in terms of total annual energy consumption. The most important issue of the BACT review is generally the economic impact. The economic impact of a control option is assessed in terms of cost effectiveness and ultimately, whether the option is economically reasonable. The economic impacts are reviewed on a cost per ton controlled basis, as directed by the U.S. EPA's Office of Air Quality Planning and Standards (OAQPS) Cost Control Manual, Fifth Edition.

The EPA has consistently interpreted the statutory and regulatory BACT definitions as containing two core requirements, which EPA believes must be met by any BACT determination, irrespective of whether it is conducted in a "top-down" manner. First, the BACT analysis must include consideration of the most stringent available technologies: i.e., those that provide the "maximum degree of emissions reduction." Second, any decision to require a lesser degree of emissions reduction must be justified by an objective analysis of "energy, environmental, and economic impacts" contained in the record.

2.3 New Versus Modified Facilities.

There can be significant differences in the technical and economic feasibility of retrofitting controls on existing boilers, versus the use of these same controls on new boilers. In addition, a given control technology may not be able to achieve the same level of control when retrofitted onto existing units as the same control technology can achieve on new units. For example, the use of low NO_x burners on existing boilers often cannot achieve the same NO_x, CO, and VOC emission rates as the use of low NO_x burners on a new boiler which has been designed to optimize the low NO_x burner design. This can in turn affect the ultimate NO_x emission rates which can be achieved by post combustion controls such as selective catalytic reduction.

Retrofitting controls on existing boilers can also have significantly different costs as compared to the use of these same technologies on new units. Retrofitting controls on existing boilers can have numerous issues, including site constraints and room for the new controls, demolition requirements for existing controls, and down time during construction and interconnection of the new systems.

2.4 Identifying Potential Control Technologies.

As stated in the U.S. EPA's October 1990 New Source Review Workshop Manual, the first step in a "top-down" analysis is to identify, for the emissions unit in question, all "available" control options. Available control options are those air pollution control technologies or techniques with a practical potential for application to the emissions unit and the regulated pollutant being evaluated. Air pollution control technologies and techniques include the application of production process or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant, including technologies employed outside of the United States. In some circumstances, inherently lower-polluting processes are appropriate for consideration as available control alternatives. The control alternatives should include not only existing controls for the source category in question, but also (through technology transfer) controls applied to similar source categories and gas streams, and innovative control technologies. Technologies required under lowest achievable emission rate (LAER) determinations are available for BACT purposes and must also be included as control alternatives and usually represent the top alternative. In Step 1, applicants should identify all control options with potential application to the emissions unit under review.

2.5 Technical Feasibility.

Step 2 of the BACT analysis involves the evaluation of all of the identified available control technologies from Step 1 to determine their technical feasibility. A control technology is technically feasible if it has been previously installed and operated successfully at a similar emission source, or there is technical agreement that the technology can be applied to the emission source. Technical infeasibility is demonstrated through clear physical, chemical, or other engineering principles that demonstrate that technical difficulties preclude the successful use of the control option.

The technology must be commercially available for it to be considered as a candidate for BACT. EPA's New Source Review Workshop Manual, page B.12 states, "Technologies which have not yet been applied to (or permitted for) full scale operations need not be considered available; an applicant should be able to purchase or construct a process or control device that has already been demonstrated in practice."

In general, if a control technology has been "demonstrated" successfully for the type of emission source under review, then it would normally be considered technically feasible. For an undemonstrated technology, “availability” and “applicability” determine technical feasibility. Page B.17 of the New Source Review Workshop Manual states:

> Two key concepts are important in determining whether an undemonstrated technology is feasible: "availability" and "applicability." As explained in more detail below, a technology is considered "available" if it can be obtained by the applicant through commercial channels or is otherwise available within the common sense meaning of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under consideration. A technology that is available and applicable is technically feasible. Availability in this context is further explained using the following process commonly used for bringing a control technology concept to reality as a commercial product:
>
> - concept stage;
> - research and patenting;
> - bench scale or laboratory testing;
> - pilot scale testing;
> - licensing and commercial demonstration; and
> - commercial sales.

Applicability involves not only commercial availability (as evidenced by past or expected near-term deployment on the same or similar type of emission source), but also involves consideration of the physical and chemical characteristics of the gas stream to be controlled. A control method applicable to one emission source may not be applicable to a similar source depending on differences in physical and chemical gas stream characteristics.

2.6 Economic Feasibility.

Economic feasibility is normally evaluated according to the average and incremental cost effectiveness. From the U.S. EPA’s New Source Review Manual, page B.31, average cost effectiveness is the dollars per ton of pollutant reduced. The incremental cost effectiveness is the cost per ton reduced from the technology being evaluated as compared to the next lower technology. The EPA NSR Review Manual states that, “where a control technology has been successfully applied to similar sources in a source category, an applicant should concentrate on documenting significant cost differences, if any, between the application of the control technology on those sources and the particular source under review”.

2.6.1 Average Cost Effectiveness.

In the EPA’s New Source Review Manual, page B.37, average cost effectiveness is calculated as:

$$\text{Average Cost Effectiveness (\$ per ton removed)} = \frac{\text{Control option annualized cost}}{\text{Baseline emission rate} - \text{Control option emissions rate}}$$

The average cost effectiveness is based on the overall reduction in the air pollutant from the baseline emission rate. In the draft Workshop Manual, the EPA states that the baseline emission rate represents uncontrolled emissions for the source. However, the manual also states that when calculating the cost effectiveness of adding controls to inherently lower emitting processes, baseline emissions may be assumed to be the emissions from the lower emitting process itself.

2.6.2 Incremental Cost Effectiveness.

In addition to determining the average cost effectiveness of a control option, the U.S. EPA's New Source Review Manual states that the incremental cost effectiveness between dominant control options should also be calculated. The incremental cost effectiveness compares the costs and emissions performance level of a control option to those of the next most stringent control option:

$$\text{Incremental Cost (\$ per incremental ton removed)} = \frac{\text{Control option annualized cost} - \text{Next control option annualized cost}}{\text{Next control option emission rate} - \text{Control option emissions rate}}$$

Chapter 3. Control Technology Review for Process P121; Biomass Fuels Material Handling Processes.

3.1 Emission Unit Description.

We Energies' 50 MW Biomass-Fired Cogeneration Facility Project will involve the installation of one new biomass fuel-fired, circulating fluidized bed (CFB) boiler. To support this new boiler, the Plant will require new biomass fuel handling equipment. The individual fuel material handling processes or operations will include delivery, unloading, conveying, hogging (shredding), storage, and reclaim. The biomass fuels will be received in a shredded form which may require final shredding to prepare the fuel for combustion. These fuels may be received either by self unloading trucks, or by fixed bed trucks which will be unloaded using a truck dumper. Under normal operation, the majority of biomass fuels will be received by the fixed bed trucks using the truck dumper, estimated at six trucks per hour. To control fugitive dust emissions to the highest degree possible, the truck dumper will unload the trucks into an enclosure. After unloading, the fuels will be conveyed via completely enclosed conveyors to Transfer Tower 1, and then to the Hog Building. In the Hog Building, the fuels will be shredded in a hog to the final size required to fire the fuels in the CFB boiler. After the Hog Building, the fuels will be conveyed to Transfer Tower 2, and then to the Biomass Fuels Storage Building. This building will have a belt tripper to load the fuels into the building, and a reclaim system to reclaim the fuels for delivery to the boiler. After the fuel is reclaimed, the fuel will be conveyed to Transfer Tower No. 1, and then to the CFB Boiler fuel silos for combustion.

To control fugitive dust emissions from these operations, the unloading enclosure, conveyor transfer points, and transfer towers will be equipped with dust collection hoods. These hoods will be connected to an induced draft fan to collect dust generated at these points. The dust laden air will be directed to a fabric filter baghouse to remove PM prior to venting the air.

Process P121 will include a dust collection system that will control dust from the unloading, conveying, and hogging operations. This process will also include a pneumatic or mechanical fuel conveying system that will convey bark and wood waste from the Domtar Mill's wood room to the Hog Building. The conveying air (if pneumatic) and dust collection pickup air will be exhausted to a fabric filter baghouse prior to discharge to the atmosphere. The conveying air will be exhausted to a fabric filter baghouse prior to discharge to the atmosphere.

3.2 BACT Baseline.

Fugitive dust emissions material handling operations is regulated under NR 415.04(2)(b), Wis. Adm. Code. This section states:

> (b) Materials handling operations are subject to the following requirements:
>
> 1. Materials handling operations, including but not limited to crushing, grinding, mixing, screening, compacting, conveying, handling of waste material with more than 5% silt, and loading and unloading of railcar, truck, ship or barge shall have fugitive emissions controlled to 20% opacity when wind speeds are less than 25 miles per hour except for 3 minutes in any hour when fugitive emissions may equal 50% opacity.
>
> 2. Any device used to control fugitive emissions from materials handling operations which has a discharge to the ambient air shall be controlled equal to or less than 0.20 pounds of particulate matter per 1000 pounds of exhaust gas.

Dust collection systems would be subject to a PM emission limit of 0.20 pounds of PM per 1,000 pounds of exhaust gas. For an exhaust gas density of 0.075 pounds per cubic foot, an emission limit of 0.20 pounds of PM per 1,000 pounds of exhaust gas is equal to 0.06 grains per dry standard cubic foot of exhaust gas.

In addition, NR 415.04(1)(b) and (f) includes the following requirements for the control of fugitive dust from roads and roadways:

> (b) Application of asphalt, water, suitable chemicals or plastic covering on dirt roads, material stockpiles and other surfaces which can create airborne dust, provided such application does not create a hydrocarbon, odor or water pollution problem.
>
> (f) The paving or maintenance of roadway areas so as not to create air pollution.

3.3 Step 1. Identify All Available Control Technologies.

There is limited information available on the control of fugitive dust and particulate matter emissions from biomass fuel material handling processes. However, these biomass fuel material handling processes are similar (to some degree) to coal material handling systems. Several studies have been conducted on the control of fugitive dust from coal material handling systems. The potential PM control technology options are summarized in Table 3-1. These controls include the use of building enclosures or hoods, the use or application of dust suppression chemicals or the application of water sprays, and the use of dust collection systems with fabric filter baghouses. In most cases, these control systems can be used in combination to improve the overall control of PM, PM_{10}, and $PM_{2.5}$ emissions.

3.4 Step 2. Eliminate Technically Infeasible Options.

All of the options identified in Table 3-1 are technically feasible control technologies.

3.5 Step 3. Rank the Technically Feasible Control Technologies.

Table 3-1 includes the potential controls and a general ranking of the control effectiveness for the proposed material handling processes. Note that in some cases, the ranking of the most effective controls can be subjective, since control efficiencies can be difficult to quantify. The use of a building or enclosure combined with the use of a dust collection system and a fabric filter baghouse is generally expected to be the most effective control. However, in some cases, this may not be the case. A dust collector is often employed primarily as a housekeeping device to help keep the inside of the building or enclosure clean. A dust collector is an active dust control system that induces an airflow into the building and out through the dust collection system. Because fabric filter baghouses emit a threshold amount of PM regardless of inlet loading, the dust collector, when in operation, is always emitting PM, albeit at very low rates. Conversely, the use of buildings or enclosures combined with wet dust suppression systems is a passive control system that does not induce an airflow out of the building or enclosure. For this control arrangement, PM emitted to the atmosphere outside of the building or enclosure is emitted passively. In some cases, especially when unloading wet or moist biomass fuels, the use of wet dust suppression systems may be more effective than the use of dust collection systems. Further, the fabric filter bags in the dust collector systems may be blinded or plugged by operating the dust collectors when very wet biomass materials are being unloaded.

TABLE 3-1. Potential PM control technologies for the biomass fuels material handling processes.

Control Technologies	Estimated Control Efficiency	
	Range	Reference
1. Building enclosures or hoods.	70 – 99%	1, 2, 3
2. Building enclosures or hoods combined with dust collectors with fabric filter baghouse.	90 - 99%	1, 3
3. Building enclosures or hoods combined with dust suppression sprays.	90 - 99%	3
4. Dust suppression and water sprays.	70 – 95%	3

Footnotes

1. *Fugitive Emissions from Coal-Fired Power Plants*, Electric Power Research Institute, Document EPRI CS-3455, June, 1984, Table 3-19.
2. EPRI CS-3455, Table 3-16.
3. Coal Handling Emissions Evaluation Roundtable (CHEER) Workshop report, Texas Natural Resource Conservation Commission, May 1996.

3.6 Step 4. Evaluate the Most Effective Controls.

Based on this analysis, the use of a building or enclosure combined with the use of dust collectors and fabric filter baghouses, or the use of a building or enclosure combined with wet dust suppression systems represent the most effective controls for PM emissions from these biomass fuel handling processes. Both dust control systems are highly effective control systems. The use of either control system will be highly effective in controlling PM, PM_{10}, and $PM_{2.5}$ emissions from these processes. Further, the flexibility to use either control system is beneficial in maintaining the control systems and will also help control emissions from changing fuel and atmospheric conditions.

TABLE 3-2. Potential emissions for Processes P121 based on the BACT limits.

Unit	Description	EMISSIONS					
		$PM_{2.5}$, lb/hr	$PM_{2.5}$, tons/yr	PM_{10}, lb/hr	PM_{10}, tons/yr	PM, lb/hr	PM, tons/yr
P121	Biomass Fuels Unloading, Screening, Hogging, and Conveying	1.87	8.21	3.75	16.41	3.75	16.41

Footnotes

Estimates for Processes P121 include biomass handling throughput from both fixed bed and self-unloading trucks, and unloading of fixed bed trucks. Emissions from self-unloading trucks is addressed Chapter 4.

3.7 Step 5. Proposed BACT Requirements.

Based on the above analysis, We Energies proposes the use of a building or enclosure combined with dust collectors and fabric filter baghouses, or the use of a building or enclosure combined with wet dust suppression systems as the best available control technology for the biomass fuel material handling processes P121. The building or enclosures will include an enclosed truck dumper hopper, fully enclosed conveyor galleries, and fully enclosed conveyor transfer points. We Energies proposes the following as BACT for these biomass fuel material handling processes:

(1) Particulate matter emissions from the biomass fuel material handling processes P121 shall be controlled using buildings or enclosures combined with dust collection systems or wet dust suppression systems as the best available control technology.

(2) PM and PM_{10} emissions from the dust collection control systems shall be limited to 0.004 grains per dry standard cubic foot of exhaust gas.

(3) $PM_{2.5}$ emissions from the dust collection control systems shall be limited to 0.002 grains per dry standard cubic foot of exhaust gas.

Chapter 4. Control Technology Review for Process F122: Biomass Fuels Self Unloading Truck Unloading.

Biomass fuels may be delivered by self unloading semi trailer trucks and unloaded to a hopper feeding the same conveyor as the truck dumper hoppers. The U.S. EPA's AP-42, Compilation of Air Pollutant Emission Factors, 5th Edition, section 13.2.4, Equation 1 may be used for estimating emissions from this unloading process which is a drop operation:

$$E = k(0.0032)\frac{\left[\frac{U}{5}\right]^{1.3}}{\left[\frac{M}{2}\right]^{1.4}}$$

where,	E	=	Emission factor, pound per ton of material unloaded		
	U	=	Mean wind speed, mph	=	6.9
	M	=	Material moisture content, %	=	25
	k	=	Particle size multiplier (dimensionless)		
	k	=	0.053 (for $PM_{2.5}$) = 0.35 (for PM_{10}) = 0.74 (for PM)		

The normal moisture content for biomass fuels is expected to range from 25 -50% on an as-received basis. Based on a mean wind speed of 6.9 miles per hour, the uncontrolled emission factor for unloading biomass fuels is 0.0000075 lb/ton ($PM_{2.5}$), 0.0000496 lb/ton (PM_{10}), and 0.00010 lb/ton (PM).

As noted previously, the majority of the biomass fuels received will normally be delivered by fixed bed trucks which will be unloaded using the truck dumper which is included as part of Process P121. For the self unloading trucks, the maximum truck unloading rate is expected to be 25 tons per truck, and 5 trucks per hour, or a total of 125 tons per hour.[1] The maximum annual use is expected to be 778,700 ton per year. Based on these values, the maximum uncontrolled $PM_{2.5}$, PM_{10}, and PM emissions are expected to be 6, 39, and 82 pounds per year.

4.1 BACT Baseline.

Fugitive dust emissions material handling operations is regulated under NR 415.04(2)(b), Wis. Adm. Code. This section states:

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[1] Emissions from fixed bed truck unloading is addressed in Chapter 3.0.

(b) Materials handling operations are subject to the following requirements:

1. Materials handling operations, including but not limited to crushing, grinding, mixing, screening, compacting, conveying, handling of waste material with more than 5% silt, and loading and unloading of railcar, truck, ship or barge shall have fugitive emissions controlled to 20% opacity when wind speeds are less than 25 miles per hour except for 3 minutes in any hour when fugitive emissions may equal 50% opacity.

4.2 Step 1. Identify All Available Control Technologies.

Potential PM control technology options for this unloading process are summarized in Table 4-1.

4.3 Step 2. Eliminate Technically Infeasible Options.

All of the options identified in Table 4-1 are technically feasible for the truck unloading process.

4.4 Step 3. Rank the Technically Feasible Control Technologies.

Table 4-1 includes the potential controls and a ranking of the control effectiveness. In some cases, these control technologies can be combined to improve the overall effectiveness of the controls. Note that the ranking of the most effective controls for fugitive dust sources can be subjective, since control efficiencies are in some cases difficult to quantify.

TABLE 4-1. Potential PM and PM_{10} control technologies for Process F123, self-unloading trucks.

Control Technologies	Control Efficiency	Reference
1. Enclosures	70 – 100%	Reference 1
2. Dust Collectors (Fabric Filter Baghouse)	80 – 99%	Reference 1
3. Telescoping chutes and/or lowering wells	75 – 85%	Reference 1
4. Water sprays and/or chemical dust suppression	70 – 90%	Reference 1
5. Minimize drop heights	25%	Reference 1

Ref. 1. *Fugitive Emissions from Coal-Fired Power Plants*, Electric Power Research Institute (EPRI), Document EPRI CS-3455, June, 1984, Table 3-19. Ref. 2. EPRI CS-3455, Table 3-16.

4.5 Step 4. Evaluate the Most Effective Controls.

4.5.1 Total Enclosure and Dust Collection System.

Enclosures combined with the use of a dust collection system and a fabric filter baghouse are generally expected to be the most effective control (or combination of controls). However, in some cases, this may be misleading. A dust collector is often employed first and foremost as a housekeeping device to help keep the inside of the building or enclosure clean. They may also be used as a safety device to ventilate the enclosure for the working personnel. In many cases, the enclosure may be required to be ventilated for safety reasons. A dust collector is an active dust control system that induces an airflow into the enclosure and out through the dust collection system. Because fabric filter baghouses emit a threshold amount of PM regardless of inlet loading, the dust collection system, when in operation, is always emitting PM, albeit at low concentrations. Conversely, a wet dust suppression system is a passive control technology that does not induce an airflow out of the enclosure. Whatever PM is emitted to the atmosphere is emitted passively.

Based on the uncontrolled emission factors and a maximum annual fuel throughput of 778,700 tons per year, this truck unloading process will have maximum uncontrolled PM, PM_{10}, and $PM_{2.5}$ emissions of 6, 39, and 82 pounds per year These are extremely low numbers, based in large part on the fact that these materials have generally high moisture contents and therefore very little emissions. For a dust collection system with an airflow of 2,000 acfm and a design grain loading of 0.004 gr/dscf, the system would emit 0.069 pounds per hour. For a fuel use of 778,700 tons per year and a design unloading process rate of 100 tons per hour, the dust control system would operate at least 7,790 hours per year. Therefore, for the combined use of an enclosure and dust collection system, potential annual PM, PM_{10}, and $PM_{2.5}$ emissions would be approximately 538 pounds per year which would actually be higher than for the normal unloading process.

4.6 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies has concluded that the use of self unloading trucks in combination with a wet dust suppression system represents the best available control technology (BACT) for process F122, the biomass fuels self unloading truck operation. We Energies proposes the following limits as BACT for Process F122:

(1) Particulate matter (PM), PM_{10}, and $PM_{2.5}$ emissions shall be controlled using self unloading trucks in combination with a wet dust suppression system as the best available control technology.

Chapter 5. Control Technology Review for Process F123: Biomass Fuels Storage and Reclaim.

After the biomass fuels are unloaded, they will be conveyed to the Hog Building to screen and shred the fuel. From the Hog Building, the fuel will be conveyed in fully enclosed conveyors to the Biomass Fuels Storage building. Inside the storage building, the biomass fuels will drop from the conveyor onto a pile. The fuels will then be reclaimed from the storage building in a "first in, first out" material management system. The maximum storage building load-in rate is expected to be 250 tons per hour and 778,700 tons per year. The maximum load-out rate is also expected to be 250 tons per hour.

Emissions from the load-in and load-out or reclaim "drop" operations may be estimated using the U.S. EPA's AP-42, *Compilation of Air Pollutant Emission Factors*, 5th Edition, section 13.2.4, Equation 1:

$$E = k(0.0032)\frac{\left[\frac{U}{5}\right]^{1.3}}{\left[\frac{M}{2}\right]^{1.4}}$$

where,	E	=	Emission factor, pound per ton of material unloaded		
	U	=	Mean wind speed, mph	=	1.0
	M	=	Material moisture content, %	=	25%
	k	=	Particle size multiplier (dimensionless)		
	k	=	0.053 (for $PM_{2.5}$) = 0.35 (for PM_{10}) = 0.74 (for PM)		

The normal moisture content for biomass fuels is expected to range from 25 -50% on an as-received basis. Based on a mean wind speed of 1.0 miles per hour inside the building, the uncontrolled emission factor for unloading biomass fuels is 6.0 x 10^{-7} lb/ton ($PM_{2.5}$), 4.0 x 10^{-6} lb/ton (PM_{10}), and 8.5 x 10^{-6} lb/ton (PM). Based on these values, the maximum uncontrolled $PM_{2.5}$, PM_{10}, and PM emissions are expected to be 1, 6, and 14 pounds per year.

5.1 BACT Baseline.

NR 415.04(1)(b) and (f) includes the following requirements for the control of fugitive dust from material storage and stockpiles:

> (b) Application of asphalt, water, suitable chemicals or plastic covering on dirt roads, material stockpiles and other surfaces which can create airborne dust, provided such application does not create a hydrocarbon, odor or water pollution problem.

5.2 Step 1. Identify All Available Control Technologies.

Potential PM and PM_{10} control technology options for the biomass fuels storage and reclaim processes are summarized in Table 5-1.

TABLE 5-1. Potential PM control technologies for Process F124, biomass fuels storage.

Control Technologies	Control Efficiency	Reference
1. Enclosures or Silos	70 – 100%	Reference 1
2. Covers	70 – 99%	Reference 1
3. Minimize handling of storage pile materials	50 – 90%	Reference 1
4. Water sprays and/or chemical dust suppression	70 – 90%	Reference 1
5. Minimize drop heights	25%	Reference 1

Ref. 1. *Fugitive Emissions from Coal-Fired Power Plants*, Electric Power Research Institute (EPRI), Document EPRI CS-3455, June, 1984, Table 3-19. Ref. 2. EPRI CS-3455, Table 3-16.

5.3 Step 2. Eliminate Technically Infeasible Options.

All of the options identified in Table 5-1 are technically feasible for the biomass fuels storage process.

5.4 Step 3. Rank the Technically Feasible Control Technologies.

Table 5-1 includes the potential controls and a ranking of the control effectiveness. In some cases, these control technologies can be combined to improve the overall effectiveness of the controls.

5.5 Step 4. Evaluate the Most Effective Controls.

The highest level of control for the biomass fuels storage and reclaim operations may be achieved by placing the fuels inside of a storage building. The use of a full enclosure will reduce emissions by 90+%.

5.6 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies has concluded that the use of a biomass fuels storage building designed to enclose the entire storage pile and the reclaim activities represents the best available control technology for process F123, the biomass fuels storage and reclaim processes. We Energies proposes the following limits as BACT for Process F1243:

(1) Particulate matter (PM), PM_{10}, and $PM_{2.5}$ emissions shall be controlled using a biomass fuels storage building designed to enclose the entire storage pile and the reclaim activities as the best available control technology.

Chapter 6. Control Technology Review for Process P124: Boilerhouse Fuel Storage Silos.

Biomass fuels will be reclaimed from the storage building and conveyed via totally enclosed conveyors to the boiler fuel silos located inside the boilerhouse. The fuel silos will include bin vents to vent the silos when filling and emptying.

The bin vents are expected to have an airflow of 300 cubic feet per minute at an uncontrolled grain loading of 0.04 grains per dry standard cubic foot of exhaust gas. Therefore, the uncontrolled emissions from the bin vents would be 0.45 tons per year.

6.1 BACT Baseline.

There are no new source performance standards for this bin vent filter. Under NR 415.04(2)(b), Wis. Adm. Code, material handling operations are subject to the following:

> (b) Materials handling operations are subject to the following requirements:
>
> 1. Materials handling operations, including but not limited to crushing, grinding, mixing, screening, compacting, conveying, handling of waste material with more than 5% silt, and loading and unloading of railcar, truck, ship or barge shall have fugitive emissions controlled to 20% opacity when wind speeds are less than 25 miles per hour except for 3 minutes in any hour when fugitive emissions may equal 50% opacity.
>
> 2. Any device used to control fugitive emissions from materials handling operations which has a discharge to the ambient air shall be controlled equal to or less than 0.20 pounds of particulate matter per 1000 pounds of exhaust gas.

Therefore, this process is subject to a PM emission limit of 0.20 pounds of PM per 1,000 pounds of exhaust gas. For an exhaust gas density of 0.075 pounds per cubic foot, an emission limit of 0.20 pounds of PM per 1,000 pounds of exhaust gas is equal to 0.06 grains per dry standard cubic foot of exhaust gas.

6.2 Step 1. Identify All Available Control Technologies.

Potential PM/PM_{10} and $PM_{2.5}$ control technology options for the bin vent filters include bin vent filters, or uncontrolled emissions. The most common bin vent filters for this application use fabric filter bags that collect entrained PM in a manner essentially the same as a fabric filter baghouse. Other bin vent filters use cartridge filters rather than fabric filters. Regardless of the filter media, the bin vent filter is a passive device, and simply exhausts whatever air is being conveyed into the silo.

6.3 Step 2. Eliminate Technically Infeasible Options.

The use of a bin vent filter and uncontrolled silo venting are technically feasible control options.

6.4 Step 3. Rank the Technically Feasible Control Technologies.

Bin vent filters will achieve a PM/PM_{10} control efficiency of approximately 99.9% of the inlet grain loading, or 0.004 grains per dry standard cubic foot of exhaust gas. In addition, bin vent filters will achieve a $PM_{2.5}$ emission rate of 0.002 grains per dry standard cubic foot of exhaust gas.

6.5 Step 4. Evaluate the Most Effective Controls.

The only commercially available or feasible control technology to control PM, PM_{10}, and $PM_{2.5}$ emissions from fuel silo bin vents is the addition of vent filters to the silos. Recent permits for similar sources have PM and PM_{10} BACT emission limits for bin vents of 0.004 gr/dscf. Based on this analysis, we have concluded that the bin vents can achieve a PM and PM_{10} outlet grain loading of 0.004 gr/dscf, and a $PM_{2.5}$ outlet grain loading of 0.002 gr/dscf.

6.6 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies has concluded that the use of a bin vent filter represents the best available control technology for the control of PM, PM_{10}, and $PM_{2.5}$ emissions from the fuel silo bin vents, Process P124. We Energies proposes the following limits as BACT for the fuel storage silos:

(1) Particulate matter (PM), PM_{10}, and $PM_{2.5}$ emissions from the boiler fuel storage silos shall be controlled using bin vent filters as the best available control technology.

(2) PM and PM_{10} emissions shall be limited to 0.004 grains per dry standard cubic foot of exhaust gas.

(3) $PM_{2.5}$ emissions shall be limited to 0.002 grains per dry standard cubic foot of exhaust gas.

Chapter 7. Control Technology Review for Processes F125 and F133; Biomass Fuels and Ash Truck Haul Roads.

Biomass fuels will be delivered to the Plant by semi-trailer trucks. The ash from the combustion of the biomass fuels will be hauled from the site by totally enclosed pneumatic semi-trailer trucks. Emissions from the truck haul truck traffic may be calculated using the paved roads emission factor from AP-42 (revision 11/2006), Section 13.2.1: *Paved Roads*, Equation (1):

$$EF_u = k\left[\frac{sL}{2}\right]^{0.65}\left[\frac{W}{3}\right]^{1.5} - C$$

where, EF_u = Vehicle Emission Factor, lb/mile traveled

k = 0.0024 [Table 13.2.1-1, for $PM_{2.5}$] = 0.016 [PM_{10}] = 0.082 [PM]

sL = silt loading, g/m^2 = 0.6

W = Average weight of truck (empty = 15 tons; loaded = 40 tons)

W = 27.5 tons

C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

C = 0.00036 lb/VMT [Table 13.2.1-2, for $PM_{2.5}$]

C = 0.00047 lb/VMT [Table 13.2.1-2, for PM_{10} and PM]

The silt loading of 0.6 g/m^2 is the ubiquitous silt loading default value for roads with less than 500 average daily travel (ADT) from AP-42, Table 13.2.1-3. The vehicle weight is the average truck weight, with a loaded weight of 40 tons, and an empty weight of 15 tons. Based on these values, the fuel and ash haul truck traffic is expected to have uncontrolled emission factors of 0.030 pounds per vehicle mile traveled (lb/VMT) for $PM_{2.5}$, 0.20 lb/VMT (PM_{10}), and 1.04 lb/ton (PM).

The biomass fuel haul trucks are expected to deliver up to 10 loads per hour, and up to 778,700 tons per year, equal to 31,150 deliveries. The total paved road round trip travel for each delivery is expected to be 3,000 feet, or 0.57 mile. Therefore, the total annual paved road vehicle miles traveled will be 17,754 miles per year. Based on these values, the maximum *uncontrolled* $PM_{2.5}$, PM_{10}, and PM emissions for the biomass fuels truck traffic would be 0.3, 1.8, and 9.2 tons per year.

The maximum ash generation rate would be 29,200 tons per year. Based on a vehicle capacity of 25 tons, this annual ash generation rate would require 1,168 shipments. In addition, the maximum daily haul rate would be 8 shipments per day. The total paved road round trip travel for each delivery is expected to be 3,000 feet, or 0.57 mile. Therefore, the total annual vehicle miles traveled will be 1,168 vehicles and 0.57 miles per vehicle, or 666 miles per year. Based on these values, the maximum *uncontrolled* $PM_{2.5}$, PM_{10}, and PM emissions for the ash truck traffic would be 0.01, 0.07, and 0.35 tons per year.

7.1 BACT Baseline.

There are no new source performance standards for these haul trucks. Under NR 415.04(1)(b), Wis. Adm. Code, material handling vehicle haul operations are subject to the following:

> **NR 415.04 Fugitive dust.** No person may cause, allow or permit any materials to be handled, transported or stored without taking precautions to prevent particulate matter from becoming airborne. Nor may a person allow a structure, a parking lot, or a road to be used, constructed, altered, repaired, sand blasted or demolished without taking such precautions.
>
> **(1)** Such precautions shall include, but not be limited to:
>
> (a) Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, or construction operations.
>
> (b) Application of asphalt, water, suitable chemicals or plastic covering on dirt roads, material stockpiles and other surfaces which can create airborne dust, provided such application does not create a hydrocarbon, odor or water pollution problem.
>
> (c) Installation and use of hoods, fans, and air cleaning devices to enclose and vent the areas where dusty materials are handled.
>
> (d) Covering or securing of materials likely to become airborne while being moved on public roads, railroads or navigable waters.
>
> (e) Conduct of agricultural practices such as tilling of land or application of fertilizers in such manner as not to create air pollution.
>
> (f) The paving or maintenance of roadway areas so as not to create air pollution.

7.2 Step 1. Identify All Available Control Technologies.

Potential PM/PM_{10} and $PM_{2.5}$ control technology options for EG33 are summarized in Table 7-1.

TABLE 7-1. Potential PM control technologies for truck haul roads.

Control Technologies	Control Efficiency	Reference
1. Pave roadways	80 – 95%	
2. Water and/or chemical dust suppression	0 – 95%	AP-42, 13.2.2-2
3. Wheel wash stations to minimize tracking	0 – 90%	AP-42, s. 13.2.1.4
4. Posted maximum vehicle speeds	0 – 50%	

Ref. 1. *Fugitive Emissions from Coal-Fired Power Plants*, Electric Power Research Institute (EPRI), Document EPRI CS-3455, June, 1984, Table 3-19. Ref. 2. EPRI CS-3455, Table 3-16.

7.3 Step 2. Eliminate Technically Infeasible Options.

All of the options identified in Table 7-1 are technically feasible.

7.4 Step 3. Rank the Technically Feasible Control Technologies.

Table 7-1 includes the potential controls and a ranking of the control effectiveness for the control of fugitive dust from the biomass delivery and ash haul trucks. These control technologies can be combined to improve the overall effectiveness of the controls.

7.5 Step 4. Evaluate the Most Effective Controls.

The highest levels of control would be achieved by paving of all roadways and by the use of dust suppression on the roads. We Energies proposes to pave all haul roads, and use dust suppression on the roads as necessary to control fugitive dust from these vehicles. This combination of controls is expected to reduce fugitive dust emissions from paved roadways by 85%. The controlled emission rates are detailed in Tables 7-2 and 7-3.

7.6 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies has concluded that the use of paved roadways in combination with dust suppression represents the best available control technology (BACT) for the biomass fuel truck haul roads and the ash truck haul roads. We Energies proposes the following limits as BACT for these processes:

(1) Particulate matter (PM), PM_{10}, and $PM_{2.5}$ emissions shall be controlled using paved roadways in combination with dust suppression as the best available control technology.

(2) A Fugitive Dust Control Plans shall be developed and submitted to the Department.

TABLE 7-2. Fugitive dust emissions from the Biomass Fuels Delivery Truck Haul Roads, Process F125.

POLLUTANT	Particle Size Multiplier	Road Surface Silt Loading	Average Weight of Truck	Exhaust, Brake, Tire Factor	PM Emission Factor	Vehicle Miles Traveled		Dust Suppressant Control Efficiency	Maximum Emission Rate	PM Emissions
		g/m^2	ton	lb/VMT	lb/VMT	VMT/hr	VMT/yr	%	lb/hr	ton/yr
$PM_{2.5}$	0.0024	0.6	27.5	0.00036	0.030	5.87	18,162	85%	0.026	0.041
PM_{10}	0.016	0.6	27.5	0.00047	0.203	5.87	18,162	85%	0.178	0.276
PM	0.082	0.6	27.5	0.00047	1.040	5.87	18,162	85%	0.916	1.417

TABLE 7-3. Fugitive dust emissions from the Ash Truck Haul Roads, Process F133.

POLLUTANT	Particle Size Multiplier	Road Surface Silt Loading	Average Weight of Truck	Exhaust, Brake, Tire Factor	PM Emission Factor	Vehicle Miles Traveled		Dust Suppressant Control Efficiency	Maximum Emission Rate	PM Emissions
		g/m^2	ton	lb/VMT	lb/VMT	VMT/hr	VMT/yr	%	lb/hr	ton/yr
$PM_{2.5}$	0.0024	0.6	27.5	0.00036	0.030	1.2	683	85%	0.0053	0.0015
PM_{10}	0.016	0.6	27.5	0.00047	0.203	1.2	683	85%	0.0357	0.0104
PM	0.082	0.6	27.5	0.00047	1.040	1.2	683	85%	0.1832	0.0533

Footnotes

1. Paved road emissions were estimated from Chapter 13.2.1, AP-42 (11/06).
2. Silt loading (g/m^2) is the Ubiquitous Silt Loading Default Value for roads with less than 500 average daily travel from AP-42, Table 13.2.1-3.
3. The average weight of both the fuel and ash haul trucks is based on a loaded truck weight of 40 tons, and an unloaded truck weight of 15 tons.
4. For fuel delivery, the vehicle miles traveled per hour is based on 10 trucks per hour, and a round trip distance of 3,100 feet (0.587 miles).
5. For ash trucks, the vehicle miles traveled per hour is based on 2 trucks per hour, and a round trip distance of 3,100 feet (0.587 miles).

Chapter 8. Control Technology Review for Process P131, CFB Boiler Bed Material Silo; and Process P132, CFB Boiler Ash Silo.

The CFB boiler will require an inert bed material to operate. For this biomass-fired boiler, the bed material will be sand. This CFB boiler bed material silo bin vent is designated as Stack S131, Process P131. Fly ash from the CFB boiler will be conveyed by a vacuum ash handling system to an ash storage silo equipped with a vent filter. The silo bin vent will allow the silo to vent when filling or emptying. This ash silo bin vent is designated as Stack S132, Process P132.

Both the CFB boiler bed material silo bin vent and the ash silo bin vent are expected to have a volumetric flow rate of 1,000 acfm (each). Based on an uncontrolled grain loading of 0.4 grains per cubic foot, these bin vents would have uncontrolled emissions of 3.4 pounds per hour and 15.0 tons per year.

8.1 BACT Baseline.

There are no new source performance standards for this bin vent filter. Under NR 415.04(2)(b), Wis. Adm. Code, material handling operations are subject to the following:

> (b) Materials handling operations are subject to the following requirements:
>
> 1. Materials handling operations, including but not limited to crushing, grinding, mixing, screening, compacting, conveying, handling of waste material with more than 5% silt, and loading and unloading of railcar, truck, ship or barge shall have fugitive emissions controlled to 20% opacity when wind speeds are less than 25 miles per hour except for 3 minutes in any hour when fugitive emissions may equal 50% opacity.
> 2. Any device used to control fugitive emissions from materials handling operations which has a discharge to the ambient air shall be controlled equal to or less than 0.20 pounds of particulate matter per 1000 pounds of exhaust gas.

Therefore, this process is subject to a PM emission limit of 0.20 pounds of PM per 1,000 pounds of exhaust gas. For an exhaust gas density of 0.075 pounds per cubic foot, an emission limit of 0.20 pounds of PM per 1,000 pounds of exhaust gas is equal to 0.06 grains per dry standard cubic foot of exhaust gas.

8.2 Step 1. Identify All Available Control Technologies.

Potential PM/PM_{10} and $PM_{2.5}$ control technology options for the bin vent filter include bin vent filters, or uncontrolled emissions. The most common bin vent filters for this application use fabric filter bags the collect entrained PM in a manner essentially the same as a fabric filter baghouse. Other bin vent filters use cartridge filters rather than fabric filters. Regardless of the filter media, the bin vent filter is a passive device, and simply exhausts whatever air is being conveyed into the silo.

8.3 Step 2. Eliminate Technically Infeasible Options.

The use of a bin vent filter and uncontrolled silo venting are technically feasible control options.

8.4 Step 3. Rank the Technically Feasible Control Technologies.

Bin vent filters will achieve a PM/PM_{10} control efficiency of approximately 99.9% of the inlet grain loading, or 0.004 grains per dry standard cubic foot of exhaust gas. In addition, bin vent filters will achieve a $PM_{2.5}$ emission rate of 0.002 grains per dry standard cubic foot of exhaust gas.

8.5 Step 4. Evaluate the Most Effective Controls.

The only commercially available or feasible control technology to control PM, PM_{10}, and $PM_{2.5}$ emissions from ash silo bin vent is the addition of vent filters to the silos. Recent permits for similar sources have PM and PM_{10} BACT emission limits for bin vents of 0.004 gr/dscf. Based on this analysis, we have concluded that the bin vents can achieve a PM and PM_{10} outlet grain loading of 0.004 gr/dscf, and a $PM_{2.5}$ outlet grain loading of 0.002 gr/dscf.

8.6 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies has concluded that the use of a bin vent filter represents the best available control technology for the control of PM, PM_{10}, and $PM_{2.5}$ emissions from the CFB boiler bed material silo bin vent, Process P131, and the ash silo bin vent, Process P132. We Energies proposes the following limits as BACT for these processes:

(4) Particulate matter (PM), PM_{10}, and $PM_{2.5}$ emissions from the CFB boiler bed material silo bin vent, Process P131, and the ash silo bin vent, Process P132, shall be controlled using a bin vent filter as the best available control technology.

(5) PM and PM_{10} emissions shall be limited to 0.004 grains per dry standard cubic foot of exhaust gas.

(6) $PM_{2.5}$ emissions shall be limited to 0.002 grains per dry standard cubic foot of exhaust gas.

Chapter 9. Control Technology Review for Process P141: Cooling Tower.

9.1 Emission Unit Description.

We Energies 50 MW Biomass Fuels Cogeneration Facility will require a new mechanical draft cooling tower which will be designated as Process P141. This cooling tower will be a plume abated tower which will use additional air to desaturate the plume leaving the cooling tower to reduce visible plume issues and the potential for icing and fogging. The specifications for the new cooling tower are summarized in Table 9-1.

TABLE 9-1. Specifications for the new plume abated mechanical draft cooling tower, Process P141.

Cooling Tower Water Design Parameters	
Total Circulating Water Flow to Cooling Tower, gpm	22,000
Number of Cells	8
Total Dissolved Solids, ppm	1,600
Design Drift Loss, %	0.0005%
Cooling Tower Physical Design Parameters	
Release Height, feet	70
Tower Enclosure Height, feet	58
Exit Diameter per cell, feet	25
Cooling Tower Gas Flow Design Parameters	
Volumetric flow rate per cell, actual cubic feet per minute	528,000
Volumetric flow rate, entire tower, actual cubic feet per minute	4,227,000

9.2 Cooling Tower Emissions.

In a mechanical draft cooling tower, the circulating cooling water is introduced into the top of the tower. As the water falls through the tower, an air flow is induced in a countercurrent flow using an induced draft fan. A portion of the circulating water evaporates, cooling the remaining water. A small amount of the water is entrained in the induced air flow in the form of liquid phase droplets or mist. Demisters are used at the outlet of cooling towers to reduce the amount of water droplets entrained in the air. The water droplets that pass through the demisters and are emitted to the atmosphere are called *drift loss*. When these droplets evaporate, the dissolved solids in the droplet become particulate matter. Therefore, cooling towers are sources of PM, PM_{10}, and $PM_{2.5}$ emissions.

Cooling tower PM emissions are calculated based on the circulating water flow rate, the total dissolved solids (TDS) in the circulating water, and the design drift loss according to the following equation:

$$E = kQ(60\text{ min/hr})(8.345\text{ lb water/gal})\left[\frac{C_{TDS}}{10^6}\right]\left[\frac{\%DL}{100}\right]$$

Where,			
	E	=	Particulate matter emissions, pounds per hour
	Q	=	Circulating water flow rate, gallons per minute = 22,000 gpm
	C_{TDS}	=	Circulating water total dissolved solids, parts per million = 1,600 ppm
	DL	=	Drift loss, % = 0.0005%
	k	=	particle size multiplier, dimensionless

The value of the particle size multiplier (k) is based on the distribution of water droplet size in the cooling tower drift loss. The diameter of the airborne particle that would be produced by the evaporation of the liquid water from a drift droplet is given by the following equation[2]:

$$d_{droplet} = d_{particle}\left[\frac{10^6 \rho_{salt}}{\rho_{water} C_{TDS}}\right]^{1/3}$$

Where,			
	$d_{droplet}$	=	Maximum diameter of the drift droplet that would produce a dry particle size of $d_{particle}$ or smaller
	$d_{particle}$	=	Dry particle (particulate matter) particle size, microns
	ρ_{salt}	=	Density of particle = 2.5 g/cm^3
	ρ_{water}	=	Density of water = 1.0 g/cm^3
	C_{TDS}	=	Circulating water total dissolved solids, parts per million, ppm

Size Distribution for Cooling Tower Particulate Emissions *

EPRI Droplet Diameter, um	EPRI % Mass Smaller	EPRI Droplet Diameter, um	EPRI % Mass Smaller
10	0.00	180	91.03
20	0.20	210	92.47
30	0.23	240	94.09
40	0.51	270	94.69
50	1.82	300	96.29
60	5.70	350	97.01
70	21.35	400	98.34
90	49.81	450	99.07
110	70.51	500	99.07
130	82.02	600	100.00
150	88.01	150	88.01

* Methodology and EPRI droplet diameter and % mass smaller values from Reisman, J. and Frisbie, G., "Calculating Realistic PM_{10} Emissions from Cooling Towers."

The above table is the drift loss droplet size distribution for a large cooling tower. For a circulating water TDS level of 1,600 ppm, the drift loss droplet size would need to be smaller than 116 microns to form

[2] From the paper *Cooling Tower Emissions Quantification Using the Cooling Technology Institute Test Code ATC-40*, Cooling Technology Institute, Paper No. TP03-08, K. Hennon, D. Wheeler, Power Generation Technologies.

PM_{10} emissions, and less than 29 microns to form $PM_{2.5}$. From this table, 82% of the cooling tower drift loss (i.e., droplet particle sizes less than 130 microns), would result in PM_{10} emissions, and 0.23% of the cooling tower drift loss would result in $PM_{2.5}$ emissions.

TABLE 9-2. Potential emissions for the new mechanical draft cooling tower, Process P141.

POLLUTANT		Flowrate gal/min	C_{TDS} ppm	Drift Loss %	*k*	Emission Rate lb/hr	ton/yr
Particulate Matter	PM	22,000	1,600	0.0005%	1.00	0.088	0.386
Particulate Matter	PM_{10}	22,000	1,600	0.0005%	0.82	0.072	0.317
Particulate Matter	$PM_{2.5}$	22,000	1,600	0.0005%	0.0023	0.00020	0.00087

9.3 BACT Baseline.

There are no specific state implementation plan (SIP) requirements or new source performance standards for this cooling tower.

9.4 Step 1. Identify all available control technologies.

In a review of recently issued permits for new power plants equipped with cooling towers, demisters are the only identified control technology to limit PM emissions. Demisters can be designed for various levels of drift loss control. The cooling tower drift loss control requirements representing BACT for recently permitted power plants are summarized in Table 9-3. From Table 9-3, the required drift loss control requirements for permits issued since 2007 range from 0.0005% to 0.002%. To reduce drift loss, additional layers of demisters must be installed in the cooling tower. This makes the cooling tower taller and increases the fan horsepower and auxiliary power requirements.

9.5 Step 2. Identify the technically feasible control options.

The only technically feasible control option for this mechanical draft cooling tower is the use of high efficiency drift eliminators.

9.6 Step 3. Rank the technically feasible control options.

The only technically feasible control option for this mechanical draft cooling tower is the use of high efficiency drift eliminators. Therefore, high efficiency drift eliminators are the top ranked control option. The highest level of control commercially available is 0.0005%.

9.7 Step 4. Evaluate the most effective controls.

The only feasible control technology for this mechanical draft cooling tower is high efficiency drift eliminators. From Table 9-3, the required drift loss control requirements for permits issued in 2007 ranged from 0.0005% to 0.002%. The highest level of control commercially available is 0.0005%.

TABLE 9-3. Cooling tower BACT requirements for recently permitted power plants.

Facility	Capacity, MW	Date	State	Drift Loss Required
Consumers Energy Karn Weadock	930	December, 2009	MI	0.0005%
AEP John W. Turk, Jr. Power Plant	600	November, 2008	AR	0.0005%
American Municipal Power	550	February, 2008	OH	0.00086%
Santee Cooper - Pee Dee Station	660	December-07	SC	0.0005%
Nelson Dewey Unit 3	330	*(draft permit)*	WI	0.0005%
Seminole Electric - Palatka Unit 3	750	August-07	FL	0.0005%
Deseret Power Coop - Bonanza	110	August-07	UT	0.001%
LS Power - Longleaf Energy Center	600	May-07	GA	0.001%
Southern Montana Electric-Highwood	250	May-07	MT	0.002%
Wisconsin Public Service – Weston 4	400	March-07	WI	0.0005%
Western Farmers Electric - Hugo 2	750	February-07	OK	0.0005%
Thoroughbred Generating Station	750	April-06	KY	0.002%
Western Green Brier, LLC	85	April-06	WV	0.0005%
Louisville Gas & Electric - Trimble 2	750	January-06	KY	0.0005%
Rocky Mountain Power - Hardin	116	January-06	MT	0.001%
Prairie State Generating Co.	750	April-05	IL	0.0005%
Longview Power, LLC	600	March-04	WV	0.002%

9.8 Step 5. Propose BACT.

Based on this analysis, We Energies has concluded that the use of high efficiency drift eliminators is the best available control technology (BACT) for the control of PM, PM_{10}, and $PM_{2.5}$ emissions from the mechanical draft cooling tower, Process P141. Based on this analysis, We Energies proposes the following limits as BACT for the control of PM, PM_{10}, and $PM_{2.5}$ emissions from the mechanical draft cooling tower, Process P141.

(1) Particulate matter (PM), PM_{10}, and $PM_{2.5}$ emissions from the mechanical draft cooling tower, Process P141, shall be controlled using high efficiency drift eliminators as the best available control technology.

(2) The cooling tower drift eliminators shall be designed for a drift loss of no more than 0.0005% of the total circulating water flow.

Chapter 10. Control Technology Review for Process P151: Emergency Feed Water Pump.

As part of this Project, We Energies is proposing to install a new diesel (compression ignition) engine driven feed water pump. The new diesel (compression ignition or CI) engine driven feed water pump will be an emergency diesel engine with 6 cylinders and a total displacement of 8.1 liters, or 1.35 liters per cylinder. This engine will be rated at 400 horsepower, and will be subject to the Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, 40 CFR Part 60, Subpart IIII. There are two possible applicable standards for this new diesel engine in 40 CFR § 60.4205 depending on whether or not the engine is considered a fire pump:

> **§ 60.4205 What emission standards must meet for emergency engines if I am an owner or operator of a stationary CI internal combustion engine?**
> (b) Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder that are not fire pump engines must comply with the emission standards for new nonroad CI engines in § 60.4202, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.
> (c) Owners and operators of fire pump engines with a displacement of less than 30 liters per cylinder must comply with the emission standards in table 4 to this subpart, for all pollutants.

The applicable standards for new nonroad CI engines in § 60.4202(a)(2) states that or engines with a maximum engine power greater than or equal to 50 HP, the engine must meet the certification emission standards for new nonroad CI engines for the same model year and maximum engine power in 40 CFR 89.112 and 40 CFR 89.113 for all pollutants beginning in model year 2007. The applicable emission standards in 40 CFR 89.112 for Tier 3 engines with Model 2006 and later include:

NOx + NMHC .... 3.0 g/hp-hr
CO....................................... 2.61 g/hp-hr
PM....................................... 0.15 g/hp-hr

The requirements in 40 CFR Part 60, Subpart IIII, Table 4 include the following for model year 2009 and later stationary fire pump engines with maximum engine power between 300 and 600 horsepower:

NOx + NMHC .... 3.0 g/hp-hr
CO.. n/a
PM....................................... 0.15 g/hp-hr

TABLE 10-1. Potential emissions for the diesel engine driven feed water pump based on limiting operation to 100 hours per year.

Pollutant		Emission Factor	Engine Output	Potential to Emit	
		g/hp-hr	hp	lb/hr	tons/year
Carbon Monoxide	CO	2.61	400	2.30	0.11
Nitrogen Oxides	NO_x	3.00	400	2.64	0.13
Particulate Matter	PM/PM_{10}	0.15	400	0.132	0.0066
Particulate Matter	$PM_{2.5}$	0.12	400	0.106	0.0053
Sulfur Dioxide	SO_2	0.0057	400	0.0050	0.0003
Volatile Organic Compounds	VOC	3.00	400	2.64	0.13
Lead	Pb	0.000034	400	0.000030	0.000002
Mercury	Hg	0.000011	400	0.000010	0.000001
Fluorides	HF	0.0010	400	0.00090	0.000045
Sulfuric Acid Mist	H_2SO_4	0.00057	400	0.00050	0.000025

Footnotes

1. NO_x, PM, and PM_{10}, emission factors are the NSPS standards in 40 CFR Part 60, Subpart IIII, Table 4 for model year 2009 and later stationary fire pump engines between 175 and 300 horsepower.

2. SO_2 emissions are based on 0.0015% sulfur fuel oil and a maximum oil consumption of 15.0 gph:

Emissions = (0.0015 lb S/100 lb oil)x(2.0 lb SO_2/lb S)x(15 gal oil/hr)x(7.0 lb oil/gal)

Emissions = 0.0032 lb/hr

3. Lead and mercury emissions are based on the emission factors for distillate oil combustion from the U.S. EPA's *Compilation of Air Pollutant Emission Factors, AP-42*, Table 1.3-10. For example, the lead emission factor is 9 pounds of lead per 10^{12} Btu of fuel oil:

Emissions = (9.0 x 10^{-12} lb Pb/Btu) x (15 gal/hr) x (140,000 Btu/gal) = 0.000019 lb/hr

4. Fluoride emissions are based on the emission factor for No. 6 oil combustion from the U.S. EPA's *AP-42*, Table 1.3-11. The fluoride emission factor is 0.0373 lb per 1,000 gallons of oil:

Emissions = (0.0373 lb F/1,000 gallons oil) x (15 gal/hr) = 0.00056 lb/hr

6. Sulfuric acid emissions are estimated at 10% of the total sulfur dioxide emissions.

10.1 Carbon Monoxide (CO) Control Technology Review.

10.1.1 Step 1. Identify All Available Control Technologies.

Available controls for CO emissions from diesel engines include good combustion practices based on engine design, diesel oxidation catalysts (DOC), and catalytically coated diesel particulate filters (DPF).

10.1.2 Step 2. Eliminate Technically Infeasible Options.

Good combustion practices, DOCs, and DPFs are technically feasible control options. However, there are potential reliability concerns with respect to the use of DOCs and DPFs on emergency engines. These filters can build up soot, causing high engine back pressure which may prevent the engine from starting.

10.1.3 Step 3. Rank the Technically Feasible Control Technologies.

DOCs and DPFs are post combustion controls and would be used in combination with good combustion practices or engine design. Both DOCs and DPFs are expected to achieve a 75% reduction in CO emissions. Based on the operational limit of 200 hours per year, and the an emission rate of 2.61 g/hp-hr, the diesel engine design would have CO emissions of 0.14 ton per year. The use of a DOC or DPF system is expected to reduce CO emissions by 75% and 0.11 ton/yr, to 0.04 ton/yr.

10.1.4 Step 4. Evaluate the Most Effective Controls.

A DOC for this engine is expected to cost about $5,000 per engine; a DPF is expected to cost about $10,000 per engine. The cost effectiveness of the DOC and DPF would be approximately $35,000 - $70,000 per ton of CO controlled, based on first year costs. For a service life of 5 years and an interest rate of 7%, the cost effectiveness would be approximately $8,600 - $17,000 per ton of CO reduced. These are very high costs, indicating that the use of diesel particulate filters and oxidation catalysts on this limited use diesel feed water pump is not an economically feasible control technology.

10.1.5 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies proposes to utilize a diesel feed water pump which complies with the applicable New Source Performance Standards in 40 CFR § 60.4205, Table 4, combined with limited hours of operation, and the use of ultra low sulfur diesel fuel as the best available control technology (BACT) for the control of CO emissions. We Energies proposes the following limits:

(1) CO emissions may not exceed 2.61 grams per horsepower hour.

(2) The sulfur content of the distillate fuel oil may not exceed 0.0015%.

(3) The diesel engine feed water pump may not be operated more than 200 hours in any consecutive 12-month period.

10.2 Nitrogen Oxides (NO_x) Control Technology Review.

10.2.1 Step 1. Identify All Available Control Technologies.

Available controls for NO_x emissions from diesel engines include good combustion practices based on engine design, and selective catalytic reduction (SCR).

10.2.2 Step 2. Eliminate Technically Infeasible Options.

Good combustion practices based on engine design is technically feasible. While SCR is available for diesel engines, we are not aware of SCR systems applied to emergency diesel engines. SCR systems cannot operate until the SCR catalyst is sufficiently preheated to achieve NO_x reduction. Because emergency diesel engines typically operate for short periods of time, SCR is not an effective control option. Therefore, SCR is not a technically feasible control option for this engine.

10.2.3 Step 3. Rank the Technically Feasible Control Technologies.

The only feasible control option is good combustion practices based on the use of a diesel engine which complies with the applicable New Source Performance Standards in 40 CFR § 60.4205, Table 4. The engine design would have potential NO_x emissions of 3.0 grams per horsepower hour and 0.17 ton per year.

10.2.4 Step 4. Evaluate the Most Effective Controls.

Because the only feasible control option is good combustion practices based on engine design, no evaluation is necessary.

10.2.5 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies proposes to utilize a diesel feed water pump which complies with the applicable New Source Performance Standards in 40 CFR § 60.4205, Table 4, combined with limited hours of operation, and the use of ultra low sulfur diesel fuel as the best available control technology (BACT) for the control of NO_x emissions. We Energies proposes the following limits:

(1) NO_x emissions may not exceed 3.0 grams per horsepower hour.

(2) The diesel engine feed water pump may not be operated more than 200 hours in any consecutive 12-month period.

10.3 PM, PM_{10}, and $PM_{2.5}$ Control Technology Review.

10.3.1 Step 1. Identify All Available Control Technologies.

Available controls for PM, PM_{10}, and $PM_{2.5}$ emissions from diesel engine includes good combustion practices (GCP), diesel particulate filters (DPF), and diesel oxidation catalysts (DOC).

10.3.2 Step 2. Eliminate Technically Infeasible Options.

Good combustion practices, DOCs, and DPFs are technically feasible control options. However, there are potential reliability concerns with respect to the use of DOCs and DPFs on emergency engines. These filters can build up soot, causing high engine back pressure which may prevent the engine from starting.

10.3.3 Step 3. Rank the Technically Feasible Control Technologies.

DOCs and DPFs are post combustion controls and would be used in combination with good combustion practices or engine design. Both DOCs and DPFs are expected to achieve a 90% reduction in PM emissions. Based on the operational limit of 200 hours per year, the engine design would have PM, PM_{10}, and $PM_{2.5}$ emissions of 0.0083, 0.0083, and 0.0067 tons per year, respectively. The use of a DOC or DPF system is expected to reduce emissions by 90%, to 0.0008, 0.0008, and 0.0007 tons per year, respectively.

10.3.4 Step 4. Evaluate the Most Effective Controls.

A DOC for this engine is expected to cost about $5,000 per engine; a DPF is expected to cost about $10,000 per engine. The cost effectiveness of the DOC and DPF for the control of PM emissions would be in excess of $1,000,000 per ton of PM controlled, based on first year costs. For a service life of 5 years and an interest rate of 7%, the cost effectiveness would be approximately $150,000 - $300,000 per ton of PM reduced. These are very high costs, indicating that the use of diesel particulate filters and oxidation catalysts on this limited use diesel generator is not an economically feasible control technology for the control of PM, PM_{10}, and $PM_{2.5}$ emissions from this emergency diesel feed water pump.

10.3.5 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies proposes to utilize a diesel feed water pump which complies with the applicable New Source Performance Standards in 40 CFR § 60.4205, Table 4, combined with limited hours of operation, and the use of ultra low sulfur diesel fuel as the best available control technology (BACT) for the control of PM, PM_{10}, and $PM_{2.5}$ emissions. We Energies proposes the following limits:

(1) PM, PM_{10}, and $PM_{2.5}$ emissions may not exceed 0.15 grams per horsepower hour.

(2) The sulfur content of the distillate fuel oil may not exceed 0.0015%.

(3) The diesel engine feed water pump may not be operated more than 200 hours in any consecutive 12-month period.

10.4 Sulfur Dioxide (SO_2) Control Technology Review.

10.4.1 Step 1. Identify All Available Control Technologies.

Sulfur dioxide (SO_2) emissions result from the oxidation of sulfur in the fuel being combusted. The only available SO_2 control technology for this emergency diesel engine is the use of low sulfur fuels. Other technologies used for other combustion sources include flue gas desulfurization (FGD) systems.

10.4.2 Step 2. Eliminate Technically Infeasible Options.

The only commercially available SO_2 control technology for diesel engines is the use of low sulfur fuels. Because FGD systems are not commercially available for diesel engines, FGD is not a technically feasible control technology for this diesel engine.

10.4.3 Step 3. Rank the Technically Feasible Control Technologies.

The only technically feasible SO_2 control option is the use of low sulfur fuels. The lowest fuel oil sulfur content available is transportation grade diesel fuel oil which is currently 0.0015%, or 15 parts per million. The use of ultra-low sulfur diesel fuel oil will limit potential SO_2 emissions to 0.0003 ton per year.

10.4.4 Step 4. Evaluate the Most Effective Controls.

Because the only technically feasible SO_2 control option is the use of low sulfur fuels, no evaluation is necessary.

10.4.5 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies proposes to utilize a diesel feed water pump which complies with the applicable New Source Performance Standards in 40 CFR § 60.4205, Table 4, combined with limited hours of operation, and the use of ultra low sulfur diesel fuel as the best available control technology (BACT) for the control of SO_2 emissions. We Energies proposes the following limits:

(1) The sulfur content of the distillate fuel oil may not exceed 0.0015%.

(2) The diesel engine feed water pump may not be operated more than 200 hours in any consecutive 12-month period.

10.5 Volatile Organic Compound (VOC) Control Technology Review.

10.5.1 Step 1. Identify All Available Control Technologies.

Available controls for VOC emissions from diesel engines include good combustion practices based on engine design, diesel oxidation catalysts (DOC), and catalytically coated diesel particulate filters (DPF).

10.5.2 Step 2. Eliminate Technically Infeasible Options.

Good combustion practices, DOCs, and DPFs are technically feasible control options. However, there are potential reliability concerns with respect to the use of DOCs and DPFs on emergency engines. These filters can build up soot, causing high engine back pressure which may prevent the engine from starting.

10.5.3 Step 3. Rank the Technically Feasible Control Technologies.

DOCs and DPFs are post combustion controls and would be used in combination with good combustion practices or engine design. Both DOCs and DPFs are expected to achieve a 50% reduction in VOC emissions. Based on the operational limit of 200 hours per year, the diesel engine design would have VOC emissions of 0.17 ton per year. The use of a DOC or DPF system is expected to reduce VOC emissions by 50% and 0.09 ton/yr, to 0.08 ton/yr.

10.5.4 Step 4. Evaluate the Most Effective Controls.

A DOC for this engine is expected to cost about $5,000 per engine; a DPF is expected to cost about $10,000 per engine. The cost effectiveness of the DOC and DPF would be approximately $56,000 - $110,000 per ton of VOC controlled, based on first year costs. For a service life of 5 years and an interest rate of 7%, the cost effectiveness would be approximately $13,000 - $27,000 per ton of VOC reduced. These are very high costs, indicating that the use of diesel particulate filters and oxidation catalysts on this limited use diesel generator is not an economically feasible control technology.

10.5.5 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies proposes to utilize a diesel feed water pump which complies with the applicable New Source Performance Standards in 40 CFR § 60.4205, Table 4, combined with limited hours of operation, and the use of ultra low sulfur diesel fuel as the best available control technology (BACT) for the control of VOC emissions. We Energies proposes the following limits:

(1) VOC emissions may not exceed 3.0 grams per horsepower hour.

(2) The sulfur content of the distillate fuel oil may not exceed 0.0015%.

(3) The diesel engine feed water pump may not be operated more than 200 hours in any consecutive 12-month period.

10.6 Fluorides (as HF) Control Technology Review.

Fluorine (F) is a trace element in diesel fuel. When diesel fuel is burned, fluorine may be emitted as hydrogen fluoride or hydrofluoric acid (HF), or as fluorine compounds, such as sodium fluoride (NaF) and calcium fluoride (CaF_2).

10.6.1 Step 1. Identify All Available Control Technologies.

The only commercially available control technology for fluoride emissions from diesel engines is the use of diesel fuel which has very low fluorine concentrations. Other potential controls include diesel particulate filters (DPF), and flue gas desulfurization systems for the control of hydrogen fluoride (HF).

10.6.2 Step 2. Eliminate Technically Infeasible Options.

The use of diesel fuel which has very low quantities of fluorine is technically feasible. While DPFs are technically feasible, we are not aware of data indicating their effectiveness in controlling fluoride emissions. Therefore, DPFs are not considered a technically feasible control option for fluoride emissions from this engine. Because FGD systems are not commercially available for diesel engines, FGD is not a technically feasible control technology for this engine.

10.6.3 Step 3. Rank the Technically Feasible Control Technologies.

The only technically feasible fluorides control technology for this diesel engine is the use of ultra low sulfur fuel oil.

10.6.4 Step 4. Evaluate the Most Effective Controls.

Because the only technically feasible fluorides control technology for this diesel engine is the use of ultra low sulfur fuel oil, further evaluation is unnecessary. The use of ultra-low sulfur fuel oil will limit fluoride emissions to 0.000056 ton (0.1 pounds) per year.

10.6.5 Step 5. Proposed BACT Requirements.

Based on this analysis, We Energies proposes to utilize a diesel feed water pump which complies with the applicable New Source Performance Standards in 40 CFR § 60.4205, Table 4, combined with limited hours of operation, and the use of ultra low sulfur diesel fuel as the best available control technology (BACT) for the control of HF emissions. We Energies proposes the following limits:

(1) The sulfur content of the distillate fuel oil may not exceed 0.0015%.

(2) The diesel engine feed water pump may not be operated more than 200 hours in any consecutive 12-month period.