



STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI  
GOVERNOR

BETH NAGUSKY  
ACTING COMMISSIONER

**FPL Energy Wyman, LLC &  
Wyman IV, LLC  
Cumberland County  
Yarmouth, Maine  
A-388-77-2-M**

**Departmental  
Findings of Fact and Order  
Regional Haze  
Best Available Retrofit Technology**

After staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 40 CFR Part 51, 38 M.R.S.A, §344, §582, §590 and §603, the Department finds the following facts:

**I. REGISTRATION**

**A. Introduction**

FACILITY	FPL Energy Wyman, LLC & Wyman IV, LLC (FPLE Wyman)
INITIAL LICENSE NUMBER	A-388-70-A-I
LICENSE TYPE	06-096 CMR 115, BART Determination, Minor Revision
NAICS CODES	221112 Electrical Generation (fossil fuel)
NATURE OF BUSINESS	850 MW Electric Generating Facility
FACILITY LOCATION	Yarmouth, Maine
DETERMINATION ISSUANCE DATE	November 2, 2010

**B. Amendment Description**

FPL Energy Wyman, LLC & Wyman IV, LLC (FPLE Wyman) has requested a minor revision to the facility's air emission license to further address Best Available Retrofit Technology (BART). FPLE Wyman was issued an initial BART license on December 11, 2007 (A-388-77-1-A). This amendment replaces the issued BART amendment and adds additional BART requirements.

**C. Application Classification**

The application for FPLE Wyman does not violate any applicable federal or state requirements and does not reduce monitoring, reporting, testing or record

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keeping. There will be no increase in any regulated pollutant. This order will be submitted as part of the Regional Haze State Implementation Plan.

This modification is determined to be a minor revision under *Major and Minor Source Air Emission License Regulations*, 06-096 CMR 115 (last amended December 24, 2005) and has been processed as such.

## II. Best Available Retrofit Technology

### A. Background

A facility is determined to have BART eligible sources if the following criteria are met (40 CFR Part 51, Subpart P and Appendix Y):

1. The facility falls into one of the 26 source specific categories identified in the Clean Air Act (CAA) of 1977,
2. The facility has emission units that entered operation in the 15 years prior to the adoption of the CAA, and
3. The facility has the potential to emit more than 250 tons/year of a single visibility impairing pollutant from units that fall under criteria #2 (Visibility impairing pollutants include PM, SO<sub>2</sub>, and NO<sub>x</sub>).

The following FPLE Wyman emission units are determined to be BART eligible under 40 CFR, Section 51:

CAA Source Specific Category	Emission Unit	Unit Capacity	Date of Start-up
Fossil Fuel Electrical Generating Facility (Category 1)	Boiler #3	1190 MMBtu/hr (118 MW)	1963
Fossil Fuel Electrical Generating Facility (Category 1)	Boiler #4	6290 MMBtu/hr (610 MW)	1975

### B. BART Analysis Summary

FPLE Wyman submitted a BART analysis to the Department in September 2009 and revised the submittal in December 2009. The analysis included a 5 step BART review of the technical feasibility and cost of compliance, the energy and non-air quality impacts of compliance, any existing air pollution control technology in use at the source, the remaining useful life of the source, and the

degree of visibility improvement anticipated from the use of the technology. The December 2009 submittal included a more thorough inclusion of NO<sub>x</sub> and PM.

Boiler #3 is a Combustion Engineering boiler, started up in 1965, with a maximum design heat input capacity of 1190 MMBtu/hr firing #6 fuel oil (2% sulfur). The boiler is equipped with multiple centrifugal cyclones for control of particulate matter and optimization and combustion controls for NO<sub>x</sub>.

Boiler #4 is a Foster Wheeler boiler, started up in 1978, with a maximum design heat input capacity of 6290 MMBtu/hr firing #2 or #6 fuel oil (0.7 % sulfur). The boiler is equipped with an electrostatic precipitator for control of particulate matter and optimization and combustion controls for NO<sub>x</sub>.

A summary of the BART information is given below.

#### PM

Emissions of PM from oil fired boilers are a function of fuel firing. It is estimated from the MANE-VU August 2006 document *Contributions to Regional Haze in the Northeast and Mid-Atlantic United States, Tools and Techniques for Apportioning Fine Particle/Visibility Impairment in MANE-VU* (pages 3-2, 4-7, 4-8) that coarse particulate matter has typically less than 4% of the contribution to visibility impairment at the MANE-VU Class I areas. Maine's contribution to regional PM<sub>10</sub> emissions is among the lowest in the region. Both boilers #3 and #4 have PM control devices, with boiler #3 having multiclones and boiler #4 having an ESP. The cost analysis of installing an ESP on boiler #3 resulted in pollutant removal cost effectiveness of \$19,000/ton of PM removed and visibility improvement cost effectiveness of \$143 million per deciview of visibility improvement. This was determined to be excessive and not cost effective.

#### SO<sub>2</sub>

Emissions of SO<sub>2</sub> from oil fired boilers are related to the sulfur in the fuel. FPLE Wyman identified the following available retrofit control technologies for reducing SO<sub>2</sub> emissions from the oil fired boilers: low sulfur #2 fuel oil, reduced sulfur #6 fuel oil, and wet or dry scrubbers.

Low sulfur #2 fuel oil (0.05% down to 0.0015%) and the use of reduced sulfur #6 fuel oil (1% or less) were considered technically feasible options. Post combustion controls of wet or dry scrubbers on large boilers were researched and generally only typically applied to coal fired boilers. The use of

scrubbing systems on oil fired boilers with a low utilization rate is considered cost prohibitive and was not considered as a BART option.

FPLE Wyman performed a cost analysis on lowering the sulfur content in both boilers. Boiler #3 currently fires 2% sulfur oil and boiler #4 currently fires 0.7% sulfur oil. The annual costs were calculated to be the following (based on the differential fuel costs):

Boiler #3		Boiler #4	
% sulfur	Annual Costs	% sulfur	Annual Costs
1.0	\$0.68 million	-	-
0.7	\$0.80 million	-	-
0.5	\$3.2 million	0.5	\$9.2 million
0.3	\$5.7 million	0.3	\$18.3 million

The visibility cost effectiveness, incremental visibility improvement, and incremental visibility cost effectiveness from switching from 2% sulfur to reduced sulfur content fuel oil for boiler #3 was the following:

% Sulfur	Ranked Visibility Impact	Visibility Cost Effectiveness (\$/deciview)	Incremental Visibility Improvement	Incremental Visibility Cost Effectiveness (\$/deciview)
1.0	1 <sup>st</sup>	\$0.69 million	-	-
	8 <sup>th</sup>	\$1.95 million	-	-
0.7	1 <sup>st</sup>	\$0.56 million	0.44 dv	\$0.27 million
	8 <sup>th</sup>	\$1.67 million	0.13 dv	\$1.92 million
0.5	1 <sup>st</sup>	\$1.82 million	0.35 dv	\$6.97 million
	8 <sup>th</sup>	\$5.41 million	0.12 dv	\$20.3 million
0.3	1 <sup>st</sup>	\$2.64 million	0.37 dv	\$6.59 million
	8 <sup>th</sup>	\$8.12 million	0.10 dv	\$24.4 million

The visibility cost effectiveness, incremental visibility improvement, and incremental visibility cost effectiveness from switching from 0.7% sulfur to reduced sulfur content fuel oil for boiler #4 was the following:

% Sulfur	Ranked Visibility Impact	Visibility Cost Effectiveness (\$/deciview)	Incremental Visibility Improvement	Incremental Visibility Cost Effectiveness (\$/deciview)
0.5	1 <sup>st</sup>	\$22.3 million	-	-
	8 <sup>th</sup>	\$39.8 million	-	-
0.3	1 <sup>st</sup>	\$19.5 million	0.53 dv	\$17.3 million
	8 <sup>th</sup>	\$35.2 million	0.29 dv	\$31.6 million

Based on the sulfur contributions in the Northeast and the information above, FPLE Wyman proposed 0.7% sulfur fuel oil for boiler #3 beginning in 2013 and the current sulfur limit of 0.7% for boiler #4 as BART.

#### NO<sub>x</sub>

Emissions of NO<sub>x</sub> from oil fired boilers are from thermal and fuel NO<sub>x</sub>. In order to minimize NO<sub>x</sub> emissions, FPLE Wyman installed combustion control technologies pursuant to 06-096 CMR 145, *NO<sub>x</sub> Control Program Regulation*. FPLE Wyman spent more than \$4.2 million to install NO<sub>x</sub> control measures including the installation of low NO<sub>x</sub> fuel atomizers, improved swirler design, and overfire and interstage air ports. The burners were optimized and fuel/air flows were balanced to the burners on each unit.

The combustion control technology upgrades were completed in April 2003 and reductions of 29-35% have been documented with boiler #3 and reductions of 24-47% have been documented with boiler #4 depending on each unit's load. These reductions are below what would have occurred if SNCR (Selective Non-Catalytic Reduction) technology were installed on the boilers.

The cost analysis of installing additional NO<sub>x</sub> controls of regenerative selective catalytic reduction (RSCR) on the boilers in addition to the current combustion controls resulted in a pollutant removal cost effectiveness of \$125,000/ton and \$83,000/ton of NO<sub>x</sub> removed for boiler #3 and boiler #4, respectively. This was determined to be excessive and not cost effective.

C. BART Determination

BART for FPLE Wyman is determined to be the following:

1. Boiler #3

PM

FPLE Wyman shall operate boiler #3 to meet a limit of 0.18 lb/MMBtu of PM after January 1, 2013.

This BART limit is more stringent than the current license limit of 0.2 lb/MMBtu of PM, which will remain in effect until December 31, 2012. The BART limit was based on review of the past three particulate stack tests which showed the following results: 0.0914 lb/MMBtu (in 2002), 0.129 lb/MMBtu (in 2004), and 0.1241 (in 2006).

SO<sub>2</sub>

The current licensed fuel oil requirement for boiler #3 is 2% sulfur by weight. By January 1, 2013, FPLE Wyman shall fire oil with 0.7% or less of sulfur by weight in boiler #3.

NO<sub>x</sub>

The NO<sub>x</sub> limit from boiler #3 alone shall be limited to 0.175 lb/MMBtu on a 90 operating day rolling average or the NO<sub>x</sub> limit from boilers #3 and #4 averaged shall be limited to 0.165 on a 90 operating day rolling average.

2. Boiler #4

PM

FPLE Wyman shall operate boiler #4 to meet a limit of 0.1 lb/MMBtu of PM, as required in air emission license A-388-70-A-I.

SO<sub>2</sub>

FPLE Wyman shall operate boiler #4 to meet a limit of 0.8 lb/MMBtu of SO<sub>2</sub> (0.7% sulfur), as required in air emission license A-388-70-A-I.

NO<sub>x</sub>

The NO<sub>x</sub> limit from boiler #4 alone shall be limited to 0.170 lb/MMBtu on a 90 operating day rolling average or the NO<sub>x</sub> limit from boilers #3 and #4 averaged shall be limited to 0.165 on a 90 operating day rolling average.

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7

This minor revision shall replace the BART determination in A-388-77-1-A (issued December 11, 2007).

**ORDER**

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards,
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants Air Emission License A-388-77-2-M pursuant to the preconstruction licensing requirements of 06-096 CMR 115 and subject to the standard and special conditions below.

Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

**Air emission license A-388-77-2-M (issued December 11, 2007) is no longer applicable and shall be replaced with the BART requirements in this air emission license.**

**The following are new Conditions:**

**(1) Boilers #3 and #4 - BART**

As federally enforceable requirements of BART, FPLE Wyman shall meet the following [40 CFR Part 51, BART]:

**A. Boiler #3**

1. FPLE Wyman shall limit PM emissions from boiler #3 to 0.18 lb/MMBtu after January 1, 2013.
2. FPLE Wyman shall limit SO<sub>2</sub> emissions from boiler #3 by firing fuel oil having 0.7% or less of sulfur by weight after January 1, 2013.

3. FPLE Wyman shall limit NO<sub>x</sub> from boiler #3 alone to 0.175 lb/MMBtu on a 90 operating day rolling average or the NO<sub>x</sub> limit from boilers #3 and #4 averaged shall be limited to 0.165 on a 90 operating day rolling average.

B. Boiler #4

1. FPLE Wyman shall limit PM emissions from boiler #4 to 0.1 lb/MMBtu.
2. FPLE Wyman shall limit SO<sub>2</sub> emissions from boiler #4 to meet a limit of 0.8 lb/MMBtu of SO<sub>2</sub> (0.7% sulfur).
3. FPLE Wyman shall limit NO<sub>x</sub> emissions from boiler #4 alone to 0.170 lb/MMBtu on a 90 operating day rolling average or the NO<sub>x</sub> limit from boilers #3 and #4 averaged shall be limited to 0.165 on a 90 operating day rolling average.

- C. Per 40 CFR Part 51 §51.308(e)(1)(v), FPLE Wyman shall maintain the control equipment required by BART and establish procedures to ensure such equipment is properly operated and maintained. This condition shall go into effect 5 years from the date of EPA's approval of Maine's Regional Haze SIP submittal. [Per 40 CFR Part 51 §51.308(e)(1)(v)]

DONE AND DATED IN AUGUSTA, MAINE THIS *2nd* DAY OF *November*, 2010.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: *Beth Nagusky*  
BETH NAGUSKY, ACTING COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date filed with the Board of Environmental Protection: \_\_\_\_\_

This Order prepared by Kathleen E. Tarbuck, Bureau of Air Quality.

