STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

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COMMISSIONER

Boralex Livermore Falls LP
Androscoggin County
Livermore Falls, Maine
A-555-77-1-A

Departmental
Findings of Fact and Order
New Source Review License

After review of the air emission license amendment application, staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 M.R.S.A, Section 344, Section 590, Chapter 115 and the Department finds the following facts:

I. Registration

A. Introduction

FACILITY	Boralex Livermore Falls LP (BLF)
Part 70 IDENTIFICATION NUMBER	A-555-70-I-A
LICENSE TYPE	Chapter 115 Major Modification
NAIC CODES	4911 – Electrical Generation
NATURE OF BUSINESS	Electric Generating Station
FACILITY LOCATION	267 Diamond Rd, Livermore Falls, ME 04254
DATE OF NSR LICENSE ISSUANCE	March 10, 2008

B. Major Modification Overview

BLF has requested a Major Modification under 06-096 CMR 115 to increase the allowable CO emission rate of Boiler #1 from 263.7 lb/hr to 556.6 lb/hr and has requested a minor modification to increase VOC emissions from 9.4 lb/hr to 12.0 lb/hr.

The 556.6 lb/hr emission rate is equivalent to a CO emission limit of 0.95 lb/MMBtu. This change is being requested after a combustion study showed the facility cannot operate at full load without exceeding the current CO limit while maintaining NO_x emissions less than 0.075 lb/MMBtu. The NO_x emission limit of 0.075 lb/MMBtu (based on a quarterly average) allows BLF to sell energy in the New England renewable energy (REC) credit market. Currently, the licensed NO_x emission limit is 0.15 lb/MMBtu. BLF has proposed to limit NO_x emissions to 0.10 lb/MMBtu at all times the facility is generating electricity for the REC market.

C. Application Classification

The application for BLF does not violate any applicable federal or state requirements and does not reduce monitoring, reporting, testing or record keeping.

Additionally, the modification of a major source is considered a major modification based on whether or not expected emissions increases exceed the "Significant Emission Increase Levels" as given in Definitions Regulation, 06-096 CMR 100 (last amended December 1, 2005).

The emission increases are determined by subtracting the average actual emissions of the 24 months preceding the modification (or representative 24 months) from the maximum future license allowed emissions. Due to the fact no boiler modifications or fuel changes are being performed, only CO and VOC emissions from Boiler 1 will be compared for this NSR amendment. The results of subtracting the average actual CO and VOC emissions from the maximum future license allowed CO and VOC emissions are as follows:

Pollutant	Average Past Actuals 01/01/2005-12/31/2006 (ton/year)	Future Permit (ton/year)	Net Change (ton/year)	Significance Level (ton/year)
CO	1037.5	2,437.9	+1400.4	100
VOC	2.7	52.6	49.9	50

Accordingly, the application has been processed as a major modification for CO and a minor modification for VOC at a major source and has been processed in accordance with 06-096 CMR 115.

II. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in 06-096 CMR 100 of the Department's regulations. Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in 06-096 CMR 100. BACT is a top-down approach to selecting air emission controls considering economic, environmental and energy impacts.

B. Description of CO Emission Rate Modification

BLF operates a 585.9 MMBtu/hr biomass fired boiler which produces 367,500 pounds of super-heated steam per hour. A steam turbine coupled to a generator converts the produced steam to approximately 36 MW (net) of electrical power. NO_x and CO emissions from the boiler are controlled using a combination of selective non-catalytic reduction (SNCR) and ECOTUBEs. This SNCR system injects urea through the ECOTUBE system, and 10 other ports (5 in the front and 5 in the back) into the boiler at a point where the flue gas is at the correct temperature to reduce NO_x emissions. The ECOTUBEs installed in the boiler consist of two liquid cooled, automatically retractable opposing tubes installed in a specific location. These ECOTUBEs, in addition to the urea, also add secondary air to improve mixing of the combustion gases so as to enhance combustion efficiency.

On June 5, 2007 Boralex conducted a combustion study at the Boralex Ashland LP facility to determine emissions of CO and ammonia while controlling NO_x emissions to a target emission rate of 0.075 lb/MMBtu at three net electrical load conditions. The following table details the results of this study:

Load	CO lb/hr	NO_x lb/MMBtu	NH_3 lb/hr
28 MW net	≤175.8 (24-hour license limit)	≤0.075	≤11.8
32 MW net	179.7 three-hour average	≤0.075	≤11.8
34 MW net	>346.5 three-hour average	≤0.075	≤11.8

The CO emission rate was the only emission rate to increase above the license limit as a result of load increases. NOx emissions did not change significantly as a result of load changes. VOC emissions increases are unknown, however, BLF will conduct a VOC stack test at higher loads (>34 MW) to determine what effect load changes and CO emission increases have on VOC.

It is also important to note that CO is a regulated pollutant and therefore is a pollutant that deserves attention. However, ambient air quality modeling throughout the state has consistently shown that Maine does not have CO levels close to threatening the environment or adversely affecting human health. This is also the case for Livermore Falls, and specifically for BLF major modification request, as documented per Section III of this license.

Given that both Boralex facilities in Livermore Falls and Ashland are identical in design and both combust biomass only, the Department believes that the results of the Ashland study can be used for BLF.

C. CO BACT Review

The current control technologies for CO in biomass fired boilers are catalytic oxidation and good combustion control.

Catalytic Oxidation

For catalytic oxidation to occur, combustion gasses pass through a passive radiator consisting of a series of narrow honeycomb passages coated with palladium. The operating temperature range for this material is 360°F to 390°F. At this required temperature range, there is an approximate CO reduction of 90% as the CO is oxidized to CO_2. Due to the design of the catalytic oxidation system, the combustion gasses must be relatively clean to keep the catalyst from becoming plugged. As a result, a catalytic oxidation system is typically installed downstream of a particulate matter (PM) control device. In the case of BLF, an electrostatic precipitator (ESP) is utilized to remove PM from the combustion gasses. The temperature of the flue gas immediately following the ESP is lower than 360°F, which is below the temperature range necessary for a catalytic oxidation system to operate properly. Methods that could be used to meet the temperature range requirements of a catalytic oxidation system include plugging a portion of the air heater tubes or completely bypassing the air heater itself. Both of these options would result in a decrease in boiler efficiency. The Department finds that CO reduction at BLF using a catalytic oxidation system is neither technically nor economically feasible.

Good Combustion Control

Primary and secondary air systems, O_2 feedback and control are methods to control CO emissions by providing the correct amount of combustion air at the correct location in the boiler. The ECOTUBE system controls CO by increasing the mixing of combustion air in the boiler as well. BLF utilizes all of these systems to ensure good combustion control and reduce CO emissions. BACT for CO control at BLF is good combustion control achieved through the use of primary and secondary air systems, O_2 feedback and control and the ECOTUBE system.

D. Proposed License Changes

The current Part 70 license (A-555-70-A-I) has the following NO_x, CO, and VOC limits:

Pollutant	lb/MMBtu	lb/hr	Timeframe & Averaging Period
NO_x	0.15	87.9	Based on a 24-hour block average.
CO	0.45	263.7	Based on a 24-hour block average.
VOC	--	9.4	At all times during plant operation

A 24 hour block average basis is defined as midnight to midnight.

BLF maintains the NOx CEM in accordance with 06-096 CMR 117. The CEM meets the monitoring requirements of 40 CFR Part 60.13 as well as 40 CFR Part 60, Appendices B and F.

NOx lb/hr, CO lb/hr, and VOC lb/hr limits are demonstrated upon stack tests in accordance with this license.

As a result of the June 5, 2007 combustion study, this Major Modification proposes to replace the previous limits with the following:

Pollutant	lb/MMBtu	lb/hr	Timeframe & Averaging Period
NO_x	0.15	87.9	At all times during plant operation, based on a 24-hour block average.
NO_x	0.10	58.3	At all times the facility is generating power for distribution and sale as renewable energy in the New England renewable energy market, based on a 24-hour block average.
NO_x	0.075	43.8	At all times the facility is generating energy for distribution and sale as renewable energy in the New England renewable energy market, based on a quarterly average.
CO	0.95	556.6	At all times during plant operation, based on a 24-hour block average.
VOC	--	12.0	At all times during plant operation

A 24 hour block average shall be defined as midnight to midnight.

BLF shall maintain the NO_x and CO CEMs in accordance with 06-096 CMR 117. The CEM shall meet the monitoring requirements of 40 CFR Part 60.13 as well as 40 CFR Part 60, Appendices B and F.

NO_x lb/hr, CO lb/hr limits, and VOC lb/hr shall be demonstrated by stack tests in accordance with this license.

E. VOC Emissions

There are some studies that suggest VOC emissions may increase proportionately with CO emissions. Since BLF is requesting to increase their CO emissions per this license amendment and although not expected, one could conclude an increase in VOC and HAPs could occur. Very little data is available to quantify this potential increase. Therefore, BLF will be limited to a licensed allowed increase from the currently licensed 9.4 lb/hr to 12.0 lb/r and from 37.9 tons per

year to 52.6 tons per year. These limits will maintain the VOC emissions increase as a minor modification based on BLF's average actual 2005 – 2006 inventory data. The VOC lb/hr emission limit shall be demonstrated by a stack test conducted by June 30, 2008. BLF shall also test for acrolien, acetaldehyde, formaldehyde, benzene, and 1,3, butadiene.

F. Revised Facility Emissions

Total Allowable Annual TPY Emissions for the Facility
(used to calculate the annual license fee)

Pollutant	Boiler (biomass)	Boiler (oil burner)	Boiler (spec. oil)	Generator	Fire Pump	Total TPY
PM	46.80	1.4	0.04	0.11	0.12	**48.5**
PM_{10}	46.80	1.4	0.04	0.11	0.12	**48.5**
SO_2	62.76	24.7	0.39	0.05	0.02	**87.9**
NO_X	351.00	10.5	0.16	4.08	1.75	**367.5**
CO	2437.9	2.5	0.01	0.88	0.38	**2441.7**
VOC	52.6	0.1	0.01	0.32	0.14	**53.2**
NH_3	69.2	--	--	--	--	**69.2**
Lead	0.51	--	--	--	--	**0.51**

III. AMBIENT AIR QUALITY ANALYSIS

A. Overview

A refined modeling analysis was performed to show that CO emissions from BLF, in conjunction with other sources, will not cause or contribute to violations of Maine Ambient Air Quality Standards (MAAQS). Given that SO_2, PM_{10} and NO_2 emissions are not changing as part of this modification and that those emissions have been adequately addressed as part of a previous modeling analysis, only CO modeling is required for this modification.

Based upon the distance from BLF to the nearest Class I area (88 kilometers) and the magnitude of CO emissions increase, MEDEP-BAQ has determined that an assessment of Class I increment standards and Air Quality Related Values (AQRVs) is not required.

B. Model Inputs

The AERMOD-PRIME refined model was used to address standards and increments in all terrain areas.

All modeling was performed in accordance with all applicable requirements of the Maine Department of Environmental Protection, Bureau of Air Quality (MEDEP-BAQ) and the United States Environmental Protection Agency (USEPA).

A valid 5-year hourly off-site meteorological database was used in the AERMOD-PRIME refined modeling analysis. Wind data was collected at 10 and 76 meters at the Wausau Paper meteorological monitoring site, located in Livermore Falls, during the 5-year period 1990-1994. When possible, surface data collected at the Augusta NWS site were substituted for missing surface data. All other missing data were interpolated or coded as missing, per EPA guidance. In addition, Augusta NWS hourly cloud cover and ceiling height, from the same time period, were used to supplement the primary surface dataset.

The surface meteorological data was combined with concurrent hourly cloud cover and upper-air data obtained from the Portland National Weather Service (NWS). Missing cloud cover and/or upper-air data values were interpolated or coded as missing, per EPA guidance.

All necessary representative micrometeorological surface variables (surface roughness, Bowen ratio and albedo) for inclusion into AERMET were calculated by MEDEP from procedures recommended by USEPA.

The modeling analysis accounted for the potential of building wake and cavity effects on emissions from all modeled stacks that are below their calculated formula GEP stack heights.

Point-source parameters, used in the modeling for BLF, are listed in Table III-1.

TABLE III-1 : Point Source Stack Parameters

Facility/Stack	Stack Base Elevation (m)	Stack Height (m)	GEP Stack Height (m)	Stack Diameter (m)	UTM Easting NAD83 (km)	UTM Northing NAD83 (km)
CURRENT/PROPOSED						
BLF						
• Main Stack	124.97	67.06	83.24	2.44	407.441	4920.473

Emission parameters for BLF, based on the worst-case operating scenario (100% load case), for MAAQS modeling are listed in Table III-2.

TABLE III-2 : Stack Emission Parameters

Facility/Stack	Averaging Periods	SO_2 (g/s)	PM_{10} (g/s)	NO_2 (g/s)	CO (g/s)	Stack Temp (K)	Stack Velocity (m/s)
CURRENT/PROPOSED							
BLF							
• Main Stack - 100% Load	All	nm	nm	nm	70.02	436.00	27.80

Key: nm = not modeled

C. Single Source Modeling Impacts

AERMOD-PRIME refined modeling, using five years of sequential meteorological data, was performed for BLF operating scenarios that represented maximum, typical and minimum operations.

The modeling results for BLF alone are shown in Tables III-3. Maximum predicted impacts that exceed their respective significance level are indicated in boldface type. No further modeling was required for pollutant/terrain combinations that did not exceed their respective significance levels.

TABLE III-3: Maximum AERMOD-PRIME Impacts from BLF Alone

Pollutant	Averaging Period	Max Impact ($\mu g/m^3$)	Receptor UTM E (km)	Receptor UTM N (km)	Receptor Elevation (m)	Class II Significance Level ($\mu g/m^3$)
CO	1-hour	4136.57	407.454	4920.510	121.51	**2000**
	8-hour	1387.59	407.414	4920.510	118.76	**500**

D. Combined Source Modeling Impacts

Because modeled CO impacts from BLF alone were greater than significance levels for all averaging periods, other sources not explicitly included in the modeling analysis must be accounted for by using representative background concentrations for the area. Background concentrations, listed in Table III-4, are derived from representative Northern Maine rural background data collected by MEDEP.

TABLE IV-4: Background Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Date
CO	1-hour	4568.00	1989[1]
	8-hour	2284.00	

Notes:
[1] Dedham – Balm Mountain Site

Because CO impacts from BLF impacts were significant, MEDEP examined other sources whose impacts would be significant in or near the BLF significant impact area. Due to the BLF's location, extent of the significant impact area and nearby source's emissions, MEDEP has been determined that no other sources would be considered for combined source CO modeling.

Table IV-5 summarizes maximum combined source impacts. The predicted impacts are added to the conservative background concentrations to demonstrate compliance with MAAQS. All combined source impacts for all pollutant/averaging periods were below their respective MAAQS. Because the impacts using this method meet MAAQS, no further MAAQS modeling for BLF needed to be performed.

TABLE IV-5 : Maximum Combined Sources AERMOD-PRIME Impacts

Pollutant	Averaging Period	Max Impact ($\mu g/m^3$)	Receptor UTM E (km)	Receptor UTM N (km)	Receptor Elevation (m)	Back-Ground ($\mu g/m^3$)	Max Total Impact ($\mu g/m^3$)	MAAQS ($\mu g/m^3$)
CO	1-hour	4136.57	407.454	4920.510	121.51	4568.00	8704.57	40000
	8-hour	1387.59	407.414	4920.510	118.76	2284.00	3671.59	10000

E. Increment

Because this modification affects CO emission only, Class II increment modeling was not required. It is important to note that that SO_2, PM_{10} and NO_2 emissions are not changing and those emissions have been adequately addressed as part of a previous increment modeling analysis.

F. Class I Impacts

Based upon the distance from BLF to the nearest Class I area (88 kilometers) and the magnitude of CO emissions increase, MEDEP-BAQ has determined that an assessment of Class I increment standards and Air Quality Related Values (AQRVs) is not required.

G. Summary

In summary, it has been demonstrated that BLF in its proposed configuration will not cause or contribute to a violation of any SO_2, PM_{10}, NO_2 or CO averaging period MAAQS or any SO_2, PM_{10} or NO_2 averaging period Class II increment standards.

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-555-77-1-A 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.

STANDARD CONDITIONS

(1) Employees and authorized representatives of the Department shall be allowed access to the licensee's premises during business hours, or any time during which any emissions units are in operation, and at such other times as the Department deems necessary for the purpose of performing tests, collecting samples, conducting inspections, or examining and copying records relating to emissions (38 M.R.S.A. §347-C).

(2) The licensee shall acquire a new or amended air emission license prior to commencing construction of a modification, unless specifically provided for in Chapter 115. [06-096 CMR 115]

(3) Approval to construct shall become invalid if the source has not commenced construction within eighteen (18) months after receipt of such approval or if construction is discontinued for a period of eighteen (18) months or more. The

Department may extend this time period upon a satisfactory showing that an extension is justified, but may condition such extension upon a review of either the control technology analysis or the ambient air quality standards analysis, or both. [06-096 CMR 115]

(4) The licensee shall establish and maintain a continuing program of best management practices for suppression of fugitive particulate matter during any period of construction, reconstruction, or operation which may result in fugitive dust, and shall submit a description of the program to the Department upon request. [06-096 CMR 115]

(5) The licensee shall pay the annual air emission license fee to the Department, calculated pursuant to Title 38 M.R.S.A. §353. [06-096 CMR 115]

(6) The license does not convey any property rights of any sort, or any exclusive privilege. [06-096 CMR 115]

(7) The licensee shall maintain and operate all emission units and air pollution systems required by the air emission license in a manner consistent with good air pollution control practice for minimizing emissions. [06-096 CMR 115]

(8) The licensee shall maintain sufficient records to accurately document compliance with emission standards and license conditions and shall maintain such records for a minimum of six (6) years. The records shall be submitted to the Department upon written request. [06-096 CMR 115]

(9) The licensee shall comply with all terms and conditions of the air emission license. The filing of an appeal by the licensee, the notification of planned changes or anticipated noncompliance by the licensee, or the filing of an application by the licensee for a renewal of a license or amendment shall not stay any condition of the license. [06-096 CMR 115]

(10) The licensee may not use as a defense in an enforcement action that the disruption, cessation, or reduction of licensed operations would have been necessary in order to maintain compliance with the conditions of the air emission license. [06-096 CMR 115]

(11) In accordance with the Department's air emission compliance test protocol and 40 CFR Part 60 or other method approved or required by the Department, the licensee shall:

A. perform stack testing to demonstrate compliance with the applicable emission standards under circumstances representative of the facility's normal process and operating conditions:

1. within sixty (60) calendar days of receipt of a notification to test from the Department or EPA, if visible emissions, equipment operating parameters, staff inspection, air monitoring or other cause indicate to the Department that equipment may be operating out of compliance with emission standards or license conditions; or
2. pursuant to any other requirement of this license to perform stack testing.

B. install or make provisions to install test ports that meet the criteria of 40 CFR Part 60, Appendix A, and test platforms, if necessary, and other accommodations necessary to allow emission testing; and

C. submit a written report to the Department within thirty (30) days from date of test completion.

[06-096 CMR 115]

(12) If the results of a stack test performed under circumstances representative of the facility's normal process and operating conditions indicate emissions in excess of the applicable standards, then:

A. within thirty (30) days following receipt of such test results, the licensee shall re-test the non-complying emission source under circumstances representative of the facility's normal process and operating conditions and in accordance with the Department's air emission compliance test protocol and 40 CFR Part 60 or other method approved or required by the Department; and

B. the days of violation shall be presumed to include the date of stack test and each and every day of operation thereafter until compliance is demonstrated under normal and representative process and operating conditions, except to the extent that the facility can prove to the satisfaction of the Department that there were intervening days during which no violation occurred or that the violation was not continuing in nature; and

C. the licensee may, upon the approval of the Department following the successful demonstration of compliance at alternative load conditions, operate under such alternative load conditions on an interim basis prior to a demonstration of compliance under normal and representative process and operating conditions.

[06-096 CMR 115]

(13) Notwithstanding any other provisions in the State Implementation Plan approved by the EPA or Section 114(a) of the CAA, any credible evidence may be used for the purpose of establishing whether a person has violated or is in violation of any statute, regulation, or Part 70 license requirement. [06-096 CMR 115]

(14) The licensee shall maintain records of malfunctions, failures, downtime, and any other similar change in operation of air pollution control systems or the emissions unit itself that would affect emission and that is not consistent with the terms and

conditions of the air emission license. The licensee shall notify the Department within two (2) days or the next state working day, whichever is later, of such occasions where such changes result in an increase of emissions. The licensee shall report all excess emissions in the units of the applicable emission limitation. [06-096 CMR 115]

(15) Upon written request from the Department, the licensee shall establish and maintain such records, make such reports, install, use and maintain such monitoring equipment, sample such emissions (in accordance with such methods, at such locations, at such intervals, and in such a manner as the Department shall prescribe), and provide other information as the Department may reasonably require to determine the licensee's compliance status. [06-096 CMR 115]

SPECIFIC CONDITIONS

(16) **Boiler #1**

A. NO_x, CO, and VOC emissions from Boiler #1 shall not exceed:

Pollutant	lb/MMBtu	lb/hr	Timeframe & Averaging Period	Origin and Authority
NO_x	0.15	87.9	At all times during plant operation, based on a 24-hour block average.	06-096 CMR 140, BPT
NO_x	0.10	58.3	At all times the facility is generating power for distribution and sale as renewable energy in the New England renewable energy market, based on a 24-hour block average.	06-096 CMR 115, BPT
NO_x	0.075	43.8	At all times the facility is generating energy for distribution and sale as renewable energy in the New England renewable energy market, based on a quarterly average.	06-096 CMR 115, BPT
CO	0.95	556.6	At all times during plant operation, based on a 24-hour block average.	06-096 CMR 115, BPT
VOC	--	12.0	At all times during plant operation.	06-096 CMR 115, BPT

Note: A 24 hour block average shall be defined as midnight to midnight.

B. BLF shall maintain the NO_x and CO CEMs in accordance with 06-096 CMR 117. The CEMs shall meet the monitoring requirements of 40 CFR Part 60.13 as well as 40 CFR Part 60, Appendices B and F.

[06-096 CMR 115, BPT]

C. NO_x lb/hr and CO lb/hr limits shall be demonstrated upon request by a stack test in accordance with this license. [06-096 CMR 115, BPT]

D. The VOC lb/hr emission limit shall be demonstrated by a stack test conducted by June 30, 2008 along with testing for acrolein, acetaldehyde, formaldehyde, benzene, and 1,3, butadiene.

E. The Department will reevaluate the CO emission limits after two years of emissions data collection.

DONE AND DATED IN AUGUSTA, MAINE THIS 10th DAY OF March 2008.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: James P. Brooks for
DAVID P. LITTELL, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: October 10, 2007
Date of application acceptance: October 24, 2007

Date filed with the Board of Environmental Protection: _____

This Order prepared by Edwin Cousins, Bureau of Air Quality.