Calpine Construction Finance Company, L.P.
Cumberland County
Westbrook, Maine
A-743-77-2-A

Departmental
Findings of Fact and Order
New Source Review
NSR #2

FINDINGS OF FACT

After review of the air emissions 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 and Section 590, the Maine Department of Environmental Protection (Department) finds the following facts:

I. REGISTRATION

A. Introduction

FACILITY	Calpine Construction Finance Company, L.P. (owner of the facility known as Westbrook Energy Center)
LICENSE TYPE	06-096 CMR 115, Major Modification
NAICS CODES	22112
NATURE OF BUSINESS	Fossil Fuel Electric Power Generation
FACILITY LOCATION	60 Eisenhower Drive, Westbrook, ME

Westbrook Energy Center is owned by Calpine Construction Finance Company, L.P. and operated by Calpine Operating Services Company, each a wholly owned indirect subsidiary of Calpine Corporation.

Westbrook Energy Center is a natural gas fired combined cycle plant with two combined cycle systems used to produce market electricity. Each combined cycle system consists of a gas combustion turbine and an unfired heat recovery steam generator (HRSG). The steam produced in the HRSG is routed to a steam turbine.

B. Amendment Description

The application submitted by Westbrook Energy Center is for an increase to the facility's allowable tons per year carbon monoxide (CO) emissions to take into account an increase in the frequency of startup and shutdown operational cycles due to recent electricity market conditions beyond Westbrook Energy Center's

control. Previously the facility operated mostly under base load conditions, running continuously with few startups and shutdowns per year. A new source review amendment was issued November 3, 2010 (A-743-77-1-A) for an advanced gas path project on the combined cycle combustion turbines which limited the turbines' CO emissions to 270 tons/year total as part of the demonstration that the modification would remain classified as minor. Westbrook Energy Center has now requested an increase in the annual allowable CO emission limit from the turbines to 525 tons/year (up from 270 tons/year) based on the current and projected increase in the number of startup and shutdown operational cycles. The short-term turbine emission limits will remain as currently licensed.

The initial Part 70 license (A-743-70-A-I, issued on August 12, 2003) includes a CO emission limit of 429.2 tons/year from the turbines, therefore the request to increase the annual CO emission limit to 525 tons/year is being processed under the licensing procedures of both new source review (06-096 CMR 115, *Minor and Major Source Air Emission License Regulations*) and Part 70 (06-096 CMR 140, *Part 70 Emission License Regulations*). This license addresses the 06-096 CMR 115 licensing process.

C. Emission Equipment

The following existing equipment is addressed in this air emission license:

Fuel Burning Equipment

Equipment	Maximum Capacity (MMBtu/hr)	Maximum Firing Rate (Mscf/hr)	Fuel Type	Date of Manufacture	Date of Installation	Stack #
Gas Turbine #1	2,013*	2,013	Natural gas	2000	2000/2001	1
Gas Turbine #2	2,013*	2,013	Natural gas	2000	2000/2001	2

* Maximum design heat input is based on each unit operating at base load with an ambient temperature of -20 °F and firing natural gas at a higher heating value of 1,000 Btu/scf.

D. Application Classification

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 (as amended).

The emission increase was determined by subtracting the average actual emissions of the 24 months preceding the modification to the turbines due to the advanced gas path project licensed in A-743-77-1-A (November 3, 2010) from the proposed future licensed allowed emissions. The advanced gas path project licensing action limited the CO tons/year emissions and that CO limit is now being revised. The results of this test are listed in the following table:

Pollutant	Average Past Actual Emissions April 2008-March 2010 (ton/year)	Future Licensed Allowed Emissions (ton/year)	Net Emissions Increase (ton/year)	Significance Emissions Increase Levels (ton/year)
CO	171	525	+354	100

Note: The above numbers are for CO from the two turbines only; no other pollutants or equipment are affected by this proposal.

Based on the net emission increase comparison to the significance emissions increase levels, this amendment is determined to be a major modification. The amendment has been processed under 06-096 CMR 115 (as amended) and is simultaneously being processed under 06-096 CMR 140 (as amended). Both a Best Available Control Analysis (BACT) and an ambient air quality impact analysis were submitted as part of the application in support of the Federal Prevention of Significant Deterioration (PSD)/New Source Review (NSR) requirements which are incorporated in 06-096 CMR 115 (as amended). Major source PSD/NSR applies to new and modified sources located within designated attainment areas where existing air quality meets the national ambient air quality standards (NAAQS) promulgated in 40 CFR Part 52, §52.21.

Federal Land Managers (FLMs) were notified of the project in May 2013. FLM staff from the U.S. Forest Service, the U.S. Fish and Wildlife Service, the National Park Service, and the Roosevelt Campobello International Park determined that Class I Air Quality Related Values (AQRV) analyses would not be required for the affected Class I areas (Acadia National Park, Moosehorn National Wildlife Refuge, Roosevelt Campobello International Park, and Presidential Range/Dry River/Great Gulf Wilderness Area). The notification to the FLMs included a project summary, distances from the source to each of the Class I areas and the magnitude of proposed emissions increase.

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 *Definitions Regulation*, 06-096 CMR 100 (as amended). Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and 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.

Before proceeding with the control requirements for each unit, a general process description and license history summary are provided as background.

Process Description and License History Summary

Westbrook Energy Center operates two combined cycle systems, each with a combustion turbine consisting of fourteen natural gas burners, followed by a heat recovery steam generator (HRSG). Combustion air enters the inlet of the gas turbine where it is compressed and mixed with the incoming fuel. The mixture is then fired in the turbine's combustion section. A dry low NO_X system minimizes NO_X emissions and creates a high pressure, hot gas. The gas expanding through the power section of the turbine rotates the turbine, converting thermal energy to work, producing electricity.

Exhaust from each turbine passes over tubes in the HRSG, creating high pressure steam. The steam is routed to the steam turbine which produces additional electricity. A selective catalytic reduction system within the HRSG controls NO_X emissions from the exhaust gases. Each turbine exhausts through its own stack.

The combustion turbines were originally licensed at a rating of 1762 MMBtu/hr each (lower heating value, with an equivalent higher heating value of 1954 MMBtu/hr). Through new source review minor modification amendment A-743-77-1-A (issued November 3, 2010), the rating for each unit was increased to 2013 MMBtu/hr based on a higher heating value due to the installation of an advance gas path project. The advanced gas path project included replacement of the combustion turbine hot gas path components allowing the combustion turbines to operate at higher combustion temperatures, resulting in increased power generation and improved operating efficiencies. In order to be classified as a

minor modification, Amendment A-743-77-1-A included specific criteria pollutant tons/year limits.

Due to the current fluctuating demands of the electricity market, startup and shutdown cycles have become more prevalent than in the past. The current mode of operation has precipitated the need for Westbrook Energy Center to amend the CO license emission limit.

B. Gas Turbines #1 and #2

Gas Turbines #1 and #2 fire natural gas only and are each rated at 2,013 MMBtu/hr. The two General Electric Model number MS7001FA units are equipped with dry low NO_X combustors and a selective catalytic reduction system to control NO_X emissions. Each unit exhausts through a separate 165 foot stack.

Westbrook Energy Center has proposed to increase the allowable CO tons/year emissions from the units from 270 tons/year to 525 tons/year based on the increase in frequency of facility startup and shutdown cycling due to electricity market conditions. The short-term emissions limits are proposed to remain as licensed.

The licensed short term CO emission limits are listed in the table below and are dependent on the mode of operation. The CO emission limit for operations during startup and shutdown periods is higher than during normal operations. The startup and shutdown emission limit was used as the CO emission limit input in the ambient air quality impact analysis to demonstrate compliance with the National Ambient Air Quality Standards. Startup and shutdown periods are specifically defined in the Part 70 license.

Licensed Short-Term CO Emission Limits for each Turbine
(no revisions requested)

Operating Scenario	CO Limit
Operations except during startup and shutdown periods	15 ppmdv corrected to 15% O_2 on a 24-hour block ave
	53 lb/hr
Operations during startup and shutdown periods	200 lb/hr CO on a 24-hour block average

1. New Source Performance Standards (NSPS)

The gas turbines, originally installed in 2000, were subject to 40 CFR Part 60, Subpart GG *Standards of Performance for Stationary Gas Turbines*, for which construction was commenced after October 3, 1977; however, the units are no

longer subject to 40 CFR Part 60 Subpart GG since they were modified through license amendment A-743-77-1-A (November 3, 2010). Based on that modification, the gas turbines are now subject to 40 CFR Part 60, Subpart KKKK, *Standards of Performance for Stationary Combustion Turbines*.

The increase in the CO tons/year emissions limit does not trigger a change to Westbrook Energy Center's applicability to 40 CFR Part 60, Subpart KKKK.

2. Best Available Control Technology (BACT)

Westbrook Energy Center submitted a BACT analysis in support of the turbines' CO tons/year increase. The BACT procedure consists of a five step process: (1) identify control technologies, (2) eliminate technically infeasible options, (3) rank remaining control technologies by control effectiveness, (4) evaluate the most effective controls and document results, including case-by-case consideration of energy, environmental, and economic impacts, and an evaluation of the next most effective control option if the top option is not selected as BACT, and (5) select BACT, the most effective control option not rejected.

The following summarizes Westbrook Energy Center's BACT analysis:

a. Identification of CO Emission Rates and Control Technologies

The formation of CO occurs in combustion devices as a product of incomplete combustion. Higher CO emissions results from a lack of oxygen and insufficient residence time at high enough temperatures to complete the final step in oxidation. However, controlling for a decrease in CO may result in increased emissions of NO_X. Conversely, lowering flame temperature to reduce NO_X emissions may result in increased emissions of CO. A balance of flame temperature, residence time and excess oxygen is needed to minimize both NO_X and CO emissions.

Control technologies used to reduce CO emissions are combustion controls and/or add-on emission controls. Combustion controls include oxygen availability, combustion temperature, turbulence, residence time, and combustion zone design. Along with turbine age, type, and size, the combustor design and the operating load can also effect CO emissions. Add-on controls consist of an oxidation catalyst which lowers the activation energy necessary for CO to react with available oxygen in the exhaust to produce CO_2. The oxidation of CO to CO_2 utilizes excess air present in the combustion turbine exhaust, with the activation energy required for the reaction to proceed lowered by the presence of a catalyst.

System design requires adequate residence time for the flue gas stream in the active catalyst zones, as well as an optimum temperature range of 700˚F to 900˚F.

As part of the CO emission control technologies review, Westbrook Energy Center identified similar units found in EPA's RACT/BACT/LAER Clearinghouse (RBLC), as well as licenses on state agency websites. The following sources were included in the review:

BACT/PSD Determinations for Combined Cycle Turbines

Facility	State	Permit Date	Turbine Size (MW)	CO Emission Limit	CO Controls
Plant McDonough, Southern Georgia Power	GA	1/7/2008	250 with burner duct	1.8 ppm, 3-hr avg at 15% O_2	Oxidation catalyst
Moxie Energy	PA	1/31/2013 (not constructed)	472 (2) or 458 (2) with all duct burners	2 ppm at 15% O_2, at all times except startup and shutdown	Oxidation catalyst
Avenal Energy Project	CA	6/21/2011 (not operating)	180	2 ppm, 1-hr ave at 15% O_2 (3 yr demonstration period) and 1.5 ppm, 1-hr ave at at 15% O_2 (post demonstration period)	Oxidation catalyst
Palmdale Hybrid Power Project	CA	10/18/2011 (not operating)	154	2 ppm, 1-hr ave at 15% O_2 (3 yr demonstration period) and 1.5 ppm, 1-hr ave at at 15% O_2 (post demonstration period)	Oxidation catalyst
Victorville 2 Hybrid Power Project	CA	3/11/2010	154	2 ppm, 1-hr ave at 15% O_2	Oxidation catalyst
Live Oaks Power Plant	GA	4/8/2010	200 with duct burner	2 ppm, 3-hr avg at 15% O_2 without duct burner	Good combustion and oxidation catalyst
Langley Gulch Power Plant, Idaho Power Co.	ID	6/25/2010	269 with duct burner	2 ppm, 3-hr rolling avg at 15% O_2	Good combustion and oxidation catalyst

Pattillo Branch Power Plant	TX	6/17/2009	350	2 ppm, 3-hr rolling avg at 15% O_2	Oxidation catalyst
King Power Station, Pondera Capital Management	TX	8/5/2010	338	2 ppm, 3-hr rolling avg at 15% O_2	Good combustion and oxidation catalyst
Thomas C. Ferguson Power Plant, Lower Colorado River Authority	TX	9/01/2011	195	4 ppm, 3-hr rolling avg at 15% O_2	Good combustion and oxidation catalyst
Channel Energy	TX	10/15/2012 (not constructed)	180 with duct burner	4 ppm, 24-hr rolling avg at 15% O_2	Good combustion
Deer Park Energy Center	TX	9/26/2012 (not constructed)	180 with duct burner	4 ppm, 24-hr rolling avg at 15% O_2	Good combustion
Es Joslin Power Plant, Calhoun Port Authority	TX	9/12/2012 (not constructed)	195	4 ppm, 24-hr rolling avg at 15% O_2	Good combustion
Nelson Energy Center	IL	12/28/2010	220 with duct burner, 2166 MMBtu/ hr	5 ppm, 1-hr	Good combustion
Cane Island Power Park	FL	9/08/2008	300 with duct burner	6 ppm, 12-month	Good combustion
Chouteau Power Plant, Associated Electric Coop	OK	1/23/2009	1882 total	8 ppm, 1-hr ave	Good combustion
Sumpter Power Plant Wolverine Power Supply	MI	11/17/2011 (convert existing unit from single cycle to combined cycle mode)	130	0.48 lb/MMBtu 24-hr rolling ave	Good combustion

b. Elimination of Technically Infeasible Options

The options reviewed in the BACT analysis for the minimization of CO emissions from Westbrook Energy Center's turbines are all technically feasible. The control options are: good combustion and an oxidation catalyst system.

c. Control Technologies Effectiveness Ranking

The results of the effectiveness ranking of the CO control technology were based on the identified permitted combined cycle turbines in the table above (section II(B)(2)(a)) and Westbrook Energy Center's license. Two

facilities in the list of reviewed sources utilize good combustion controls and oxidation catalyst systems and have a CO emission limit of 1.8 ppm. Two facilities are listed with a lower 1.5 ppm CO limit following a 3 year demonstration period with a 2 ppm limit; however, the units are not operating and compliance with the 1.5 ppm limit has not been demonstrated. The control level for good combustion controls were identified as 4 - 8 ppm CO. However, the 4 ppm CO limit is listed for units that have not been built and the lower limit has not been demonstrated.

BACT for CO at the time of initial licensing for Westbrook Energy Center in 1998 was good combustion controls and a CO emission limit of 15 ppm. The turbines achieve CO emissions of 15 ppm or less over the load range of 50-100%, while also utilizing dry low NO_X combustors to simultaneously minimize NO_X emissions.

The BACT limit for existing units of this type and size using good combustion control was considered to be 15 ppm for this analysis, as compared to the 4-8 ppm range for newer units.

The following presents the ranking of the CO control options:

CO Control Options Ranking

Control Option	Control Emission Level	Rank
Oxidation catalyst and good combustion controls	1.8 ppm	1
Good combustion controls	15 ppm	2

d. Evaluation of the Most Effective Control – Oxidation Catalyst

The most effective control technology for reducing CO emissions from combustion turbines is the use of an oxidation catalyst, along with good combustion controls. Westbrook Energy Center evaluated the energy, environmental, and economic impacts of installing an oxidation catalyst. A two bed catalyst system was assessed: the first catalyst bed consisting of a selective catalytic reduction (SCR) for NO_X control and the second bed consisting of a CO catalyst. The combined NO_X/CO catalyst was chosen due to the space constraints of retrofitting the existing turbines. A stand-alone CO oxidation catalyst cannot physically be installed within the existing space and equipment restrictions. Westbrook Energy Center's existing SCR catalyst would have to be removed in order to install the proposed system.

i. Energy Impacts

The energy impacts of the catalyst system include a reduction in performance of the turbines due to increased flow resistance associated with the additional oxidation catalyst. This flow resistance creates a pressure drop, reducing turbine performance. Westbrook Energy Center estimated an annual energy performance loss equating to approximately $173,000 based on an analysis of operating parameters, market/revenue information, and fuel costs projected out to 2022.

ii. Environmental Impacts

The environmental impacts of the catalyst system include the reduction of CO emissions and the possible formation of ammonia salts. During periods of startup, the CO oxidation catalyst system's removal efficiency is reduced relative to steady state operations.

Vendor information was used to calculate potential CO reductions of approximately 420 tons/year total for both units. The potential 420 tons/year CO reduction was based on a CO control efficiency of 80%. However, the catalyst is ineffective at temperatures below 500°F. During startups and shutdowns, the turbine temperatures can vary; therefore, the actual CO removal efficiency for Westbrook Energy Center may be significantly lower than 80% due to frequent startups/shutdowns at the facility.

iii. Economic Impacts

An economic analysis was performed to identify the costs associated with the installation and operation of an oxidation catalyst/SCR system to obtain a lower CO emission limit and meet the existing licensed NO_X emission limit for Westbrook Energy Center. The combined NO_X/CO catalyst system would replace and enhance the currently existing SCR NO_X system which would be removed if a retrofit was required because of physical space limitations. The boiler vendor (NEM) provided estimates of total system capital expenditure and Calpine Corporation provided estimates for the total capital investment excluding freight, instrumentation, and spent SCR catalyst removal. EPA's Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual, sixth edition (January 2002) was used to estimate the freight and instrumentation costs. Westbrook Energy Center provided spent SCR catalyst removal cost based on SCR catalyst replacement at the facility in 2010. The current catalyst would need to be removed prior to installation of a new system.

The total annualized capital investment and annual cost of operating an oxidation catalyst were calculated using procedures contained in the OAQPS Control Cost Manual and information provided by Calpine Construction Management Company and Calpine Corporation, Mechanical Services, Engineering and Construction. All estimated costs were based on limited engineering and design details available at the time of analysis. The results are shown in the following table (specific assumptions used in the estimates can be found in the license application):

CO Oxidation Catalyst/SCR Catalyst System Cost Analysis

	Costs ($)	Totals ($)
CAPITAL		
Equipment (2 total systems)	1,708,840	
Equipment installation	2,291,160	
Freight	85,442	
Instrumentation	170,884	
Spent SCR catalyst removal	4,500	
Lost revenue for installation downtime	1,331,778	
Capital Cost Total		**5,592,604**
ANNUAL (Direct and Indirect)		
Direct maintenance, labor and materials	41,063	
Direct Catalyst replacement (3 yr life, 2% interest)	554,880	
Direct Performance loss	173,000	
Indirect overhead (70% total labor and materials)	28,744	
Indirect administrative charges	111,852	
Indirect insurance	111,852	
Indirect capital recovery (10 yr at 2% interest)	533,561	
Annual Cost Total		**1,554,951**

For Westbrook Energy Center's situation, the vendor guarantee of 80% control efficiency does not necessarily correlate to an assured amount of CO emissions reduction for the cost since startup operating conditions will not be controlled to 80% until the catalyst temperature reaches 500°F and Westbrook Energy Center anticipates continued frequent startup and shutdown cycles.

iv. Conclusion

The Department has evaluated the energy, environmental, and economic impacts associated with the installation and operation of a combined NO_X/CO catalyst system to reduce CO emissions. The

Department has determined that the combined NO_X/CO catalyst system does not represent BACT for CO emissions due to the energy and economic impacts as well as the reduced effectiveness of the CO catalyst during startup and shutdown cycles which are the periods during which a majority of the CO emissions occur.

e. Evaluation of the Next Most Effective Control – Good Combustion Control

The next most effective CO control option was identified as good combustion control practices. The two turbines are equipped with dry low NO_X combustors which achieve low CO emissions over the 50-100% load range. The units are operated to minimize pollutants and maximize efficiency. Many of the new facilities listed in the RBLC were found to use good combustion practices to reduce CO emissions.

f. BACT Selection – Good Combustion Control

Westbrook Energy Center has proposed that good combustion control is BACT for CO emissions from the turbines, considering the potential energy, environmental, and economic impacts of an oxidation catalyst, as presented in the sections above.

The Department has determined that Westbrook Energy Center's proposal of the use of dry low NO_X combustors, good combustion controls, and meeting the current CO air emission license limit of 15 ppmdv corrected to 15% O_2 on a 24-hr block average basis (excluding startup and shutdown periods and 200 lb/hr during startup and shutdown periods) is BACT for the existing gas turbines. Furthermore, Maine is in attainment with the National Ambient Air Quality Standards for CO and the results of the ambient air quality impact analysis at the startup and shutdown CO emission limit of 200 lb/hr are below CO significant impact levels without an oxidation catalyst.

C. Incorporation into the Part 70 Air Emission License

The requirements in this 06-096 CMR 115 New Source Review amendment shall apply to the facility upon amendment issuance. Per *Part 70 Air Emission License Regulations*, 06-096 CMR 140 (as amended), Section 1(C)(8), for a modification that has undergone NSR requirements or been processed through 06-096 CMR 115, the source must then apply for an amendment to the Part 70 license within one year of commencing the proposed operations as provided in 40 CFR Part 70.5. Due to the immediate changes necessary to the Part 70 air emission license

(A-743-70-A-I) to increase the facility's license allowed CO tons/year emission limit from 429.2 tons/year to 525 tons/year, a Part 70 Significant Modification is being processed simultaneously with this amendment.

D. Annual Emissions

Westbrook Energy Center is licensed for the following annual emissions, based on a 12 month rolling total. The tons per year limits were calculated based on license limitations on the gas turbines (found in licenses A-743-77-1-A and A-743-77-2-A), the auxiliary boiler fuel limit of 98 MMscf/year, the emergency diesel generator operational limit of 275 hours/year and the diesel fire pump operational limit of 200 hours/year.

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

	PM	PM_{10}	SO_2	NO_x	CO	VOC	NH_3
Gas Turbines #1 and #2 (total)	36	26	90	137	525	26	188
Auxiliary Boiler	0.49	0.49	0.05	1.72	7.41	0.98	--
Emergency Generator	0.11	0.11	0.06	3.52	0.94	0.09	--
Emergency Fire Pump	0.04	0.04	0.02	1.39	0.3	0.01	--
Cooling Tower	12.3	12.3	--	--	--	--	--
Total TPY	**48.9**	**38.9**	**90.1**	**143.6**	**533.6**	**28.1**	**188**

III. AMBIENT AIR QUALITY ANALYSIS

A. Overview

A refined modeling analysis was performed to show that emissions from Westbrook Energy Center, in conjunction with other sources, will not cause or contribute to violations of National Ambient Air Quality Standards (NAAQS) for CO. Since SO_2, PM_{10} and NO_2 were addressed as part of a previous modeling analysis and because no emissions changes for these pollutants are proposed, no further modeling for these pollutants is required.

The current licensing action for Westbrook Energy Center represents a major modification to an existing major source. Based upon the magnitude of proposed emissions increase and the distance from the source to any Class I area, the

affected Federal Land Managers (FLMs) and MEDEP-BAQ have determined that an assessment of Class I Air Quality Related Values (AQRVs) is not required.

B. Model Inputs

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

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 refined modeling analysis. Wind data was collected at heights of 10 and 100 meters at the SAPPI Westbrook meteorological monitoring site during the 5-year period 1989 - 1993. The following parameters and their associated heights were as follows:

TABLE III-1 : Meteorological Parameters and Collection Heights

Parameter	Sensor Height(s)
Scalar Wind Speed	10 meters, 100 meters
Scalar Wind Direction	10 meters, 100 meters
Standard Deviation of Wind Direction (Sigma A)	10 meters, 100 meters
Temperature	7 meters

Each year of meteorological data met the 90% data recovery requirement, both singularly and jointly. Missing data from the primary site were substituted with representative data, interpolated or coded as missing, per USEPA guidance.

In addition, hourly Portland National Weather Service data, from the same time period, were used to supplement the primary surface dataset for the required variables (cloud cover and ceiling height) that were not explicitly collected at the SAPPI meteorological monitoring site. Concurrent upper-air data from the Portland National Weather Service site were also used in the analysis. Missing cloud cover and/or upper-air data values were interpolated or coded as missing, per USEPA guidance.

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

Point-source parameters used in the modeling for Westbrook Energy Center are listed in Table III-2.

TABLE III-2 : 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						
Westbrook Energy Center						
• Gas Turbine #1	28.96	50.29	79.25	5.49	388.966	4834.733
• Gas Turbine #2	28.96	50.29	79.25	5.49	388.955	4834.765

Emission parameters for CO NAAQS modeling are listed in Table III-3.

TABLE III-3 : Stack Emission Parameters

Facility/Stack	Averaging Periods	SO_2 (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	NO_2 (g/s)	CO (g/s)	Stack Temp (K)	Stack Velocity (m/s)
MAXIMUM LICENSE ALLOWED								
Westbrook Energy Center – Startup/Shutdown Scenario – 50% load								
• Turbine #1	All	-	-	-	-	25.20	372.04	10.74
• Turbine #2	All	-	-	-	-	25.20	372.04	10.30

C. Single Source Modeling Impacts

AERMOD-PRIME refined modeling was performed to demonstrate that an annual emissions increase of CO stemming from frequent startup and shutdown operational cycles would not violate NAAQS. The startup and shutdown cycles were not evaluated for CO in previous modeling analyses.
Modeling results for Westbrook Energy Center alone are shown in Table III-4.

TABLE III-4 : Maximum AERMOD-PRIME Impacts from Westbrook Energy Center 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	513.73	388.915	4834.632	32.41	**2000**
	8-hour	371.58	388.816	4834.583	31.85	**500**

D. Combined Source Modeling Impacts

Because all modeled impacts from Westbrook Energy Center alone were less than significance levels for all CO averaging periods, no background data or other local sources need to be included in the analysis.

E. Class I Impacts

Based upon the magnitude of proposed emissions increase and the distance from the source to any Class I area, the affected Federal Land Managers (FLMs) and MEDEP-BAQ have determined that an assessment of Class I Air Quality Related Values (AQRVs) is not required.

F. Summary

In summary, it has been demonstrated that emissions from Westbrook Energy Center will not cause or contribute to violations of National Ambient Air Quality Standards (NAAQS) for CO.

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-743-77-2-A pursuant to the preconstruction licensing requirements of 06-096 CMR 115 and subject to the standard and specific 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.

SPECIFIC CONDITIONS

The following shall replace condition (1)(D) in air emission license A-743-77-1-A (November 3, 2010):

(1) Gas Turbines #1 and #2

D. Annual Limits

Calculations of annual emissions from the gas turbines shall be based on the best information available, including, but not limited to continuous emission monitoring system data, stack test data, and mass balance methods as appropriate.

1. In order to demonstrate that the modification to the Gas Turbines #1 and #2 addressed in A-743-77-1-A remains a minor modification for PM, PM_{10}, SO_2, and NO_X, actual emissions from the gas turbines combined shall not exceed the following annual emission rates which are based on past "actual emissions" plus slightly less than "significant emission increase" levels:

Emission Units	PM (TPY)	PM_{10} (TPY)	SO_2 (TPY)	NO_x (TPY)
Gas Turbines #1 and #2 total	36	26	90	137

Compliance with the PM, PM_{10}, SO_2, and NO_X annual emission limits shall be determined on a 12-month rolling total basis for a period of ten years following commencing operation of the proposed modification.

2. CO and VOC shall not exceed the following annual licensed allowed emission rates, on a 12 month rolling total basis:

Emission Units	CO (TPY)	VOC (TPY)
Gas Turbines #1 and #2 total	525	26

DONE AND DATED IN AUGUSTA, MAINE THIS 14 DAY OF August , 2013.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Marc Allen Robert Cone for
PATRICIA W. AHO, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: June 3, 2013
Date of application acceptance: June 3, 2013

Date filed with the Board of Environmental Protection:

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

Filed
AUG 15 2013
State of Maine
Board of Environmental Protection