STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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Thermogen I, LLC
Penobscot County
Millincocket, Maine
A-1072-77-2-A

Departmental
Findings of Fact and Order
New Source Review
NSR #1

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., §344 and §590, the Maine Department of Environmental Protection (Department) finds the following facts:

I. REGISTRATION

A. Introduction

Thermogen I, LLC (Thermogen) was issued major source air emission license A-1072-77-1-N on September 24, 2012, permitting the construction and operation of emission sources associated with their wood torrefaction processing facility which will produce torrefied wood pellets from woody biomass.

Thermogen I, LLC has requested an amendment to their license to make changes to the main stack, relocating it to the top of the Wet Electrostatic Precipitator (WESP) structure and reducing the height to 125 feet above ground level. Originally, the proposed stack was to be a separate free-standing stack adjacent to the WESP at a height of 150 feet above ground level.

The equipment addressed in this license is located at 1 Katahdin Ave, Millinocket, Maine.

B. Emission Equipment

This license addresses the main stack (stack #1) of the wood torrefaction process.

C. Application Classification

This amendment will not increase previously licensed emissions from the facility. To allow for public notification the application was processed as a minor modification through *Major and Minor Source Air Emission License Regulations*, 06-096 CMR 115 (as amended).

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 *Definitions Regulation*, 06-096 CMR 100 (as amended). BACT is a top-down approach to selecting air emission controls considering economic, environmental and energy impacts.

B. Stack Location and Height Revision

Thermogen has requested a revision of the main stack's originally proposed location and height. The stack change allows for the use of the wet electrostatic precipitator structure to be used, rather than installing a separate free-standing stack. The main stack height will be reduced to 125 feet above ground level to assure that the stack is not considered a potential obstruction to aviation approaching or departing the Millinocket Municipal Airport. The stack was previously licensed at 150 feet above ground level.

No other changes are being proposed to air emission license A-1072-77-1-N. The BACT and Lowest Achievable Emission Rate (LAER) conditions of that license, including emission limits, operational and control requirements, recordkeeping, and stack testing continue to apply.

C. Annual Emissions

Annual emissions from the Thermogen facility are not changing with this amendment.

III. AMBIENT AIR QUALITY ANALYSIS

A. Overview

Due to recent design changes at the Thermogen facility, the stack height and location differ slightly than originally modeled. An updated modeling analysis,

incorporating the minor changes in stack parameters, was submitted to the Department for review and approval.

A refined modeling analysis was performed to show that emissions from Thermogen, in conjunction with other sources, will not cause or contribute to violations of National Ambient Air Quality Standards (NAAQS) for SO_2, PM_{10}, $PM_{2.5}$, NO_2 or CO or to Class II increments for SO_2, PM_{10}, $PM_{2.5}$ or NO_2.

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 the Maine Department of Environmental Protection, Bureau of Air Quality (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 and increments in all areas. If applicable, 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 MEDEP-BAQ and the United States Environmental Protection Agency (USEPA).

A valid 5-year hourly on-site meteorological database was used in the AERMOD-PRIME refined modeling analysis. The following parameters and their associated heights were collected at the Great Northern Paper meteorological monitoring site during the 5-year period 1990-1993 and July 1, 1994 – June 30, 1995:

TABLE III-1 : Meteorological Parameters and Collection Heights

Parameter	Sensor Height(s)
Wind Speed	10 meters, 90 meters
Wind Direction	10 meters, 90 meters
Standard Deviation of Wind Direction (Sigma A)	10 meters, 90 meters
Temperature	3 meters

Per USEPA guidance, any small gaps (two hours or less) of missing on-site data were filled in using linear interpolation. Larger gaps of missing data (three or more hours) were coded as missing.

In addition, hourly Bangor NWS 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 Great Northern Paper meteorological monitoring site. Concurrent upper-air data from the Caribou NWS

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 Thermogen 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						
Thermogen						
• Stack #1	118.87	38.10	42.34	2.13	522.847	5054.876

Emission parameters for NAAQS and increment modeling are listed in Table III-3. For the purposes of determining PM_{10} and $PM_{2.5}$ impacts, all PM emissions were conservatively assumed to convert to PM_{10} and $PM_{2.5}$. For the purpose of determining NO_2 impacts, all NO_x emissions were conservatively assumed to convert to NO_2.

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								
Thermogen								
• Stack #1 – Normal High	All	0.0015	0.49	0.49	1.64	1.39	350.90	12.18
• Stack #1 – Normal Medium	All	0.0014	0.42	0.42	1.64	1.01	361.48	10.63
• Stack #1 – Normal Low	All	0.0013	0.35	0.35	1.64	0.76	430.90	12.16
• Stack #1 – Startup High	All	0.0013	1.42	1.42	3.97	2.78	558.70	23.92
• Stack #1 – Startup Medium	All	0.0011	1.18	1.18	3.47	2.00	579.82	22.54
• Stack #1 – Startup Low	All	0.0010	1.06	1.06	3.05	1.50	602.00	21.37
BASELINE – 1987								
Thermogen								
• No sources existed in the 1987 baseline year; no baseline credit to be taken.								
BASELINE – 1977								
Thermogen								
• No sources existed in the 1977 baseline year; no baseline credit to be taken.								

C. Single Source Modeling Impacts

AERMOD-PRIME refined modeling was performed for a total of six operating scenarios that represented a range of normal and start-up operations. Modeling results for Thermogen alone are shown in Table III-4. It is important to note that predicted impacts for all pollutants/averaging periods are based on the highest-first-high (H1H) concentration from all five years of meteorological data. Therefore, the results are overly conservative.

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-4 : Maximum AERMOD-PRIME Impacts from Thermogen Alone

Pollutant	Averaging Period	Max Impact [a] ($\mu g/m^3$)	Class II Significance Level ($\mu g/m^3$)	Receptor UTM E (km)	Receptor UTM N (km)	Receptor Elevation (m)	Load Case
SO_2	1-hour	0.038	**10[b]**	523.000	5053.600	181.74	**Normal High**
	3-hour	0.020	**25**	523.000	5053.600	181.74	**Normal High**
	24-hour	0.004	**5**	522.600	5054.450	151.42	**Normal High**
	Annual	0.001	**1**	522.830	5055.280	115.15	**Normal High**
PM_{10}	24-hour	1.56	**5**	522.600	5054.450	151.42	**Startup High**
	Annual	0.07	**1**	522.830	5055.280	115.15	**Normal High**
$PM_{2.5}$	24-hour	**1.56**	**1.2**	522.600	5054.450	151.42	**Startup High**
	Annual	0.07	**0.3**	522.830	5055.280	115.15	**Normal High**
NO_2	1-hour	**46.25**	**10[c]**	523.000	5053.600	181.74	**Normal Medium**
	Annual	0.25	**1**	522.830	5055.280	115.15	**Normal Medium**
CO	1-hour	35.22	**2000**	523.000	5053.600	181.74	**Normal High**
	8-hour	7.39	**500**	523.000	5053.600	181.74	**Normal High**

[a] Values based on the H1H (highest-1st-high) concentration from five years of meteorological data
[b] Interim Significant Impact Level (SIL) adopted by Maine
[c] Interim Significant Impact Level (SIL) adopted by NESCAUM states

D. Combined Source Modeling Impacts

For predicted modeled impacts from Thermogen alone that exceeded significance levels, as indicated in boldface type in Table III-4, 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-5, are derived from representative rural background data for use in the Eastern Maine region.

TABLE III-5 : Background Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)
$PM_{2.5}$	24-hour	17[a]
NO_2	1-hour	43[b]

[a] Greenville Site - Greenville
[b] MicMac Site - Presque Isle

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

For pollutant averaging periods that exceeded significance levels, the maximum modeled impacts were added with conservative rural background concentrations to demonstrate compliance with NAAQS, as shown in Table III-6. Because impacts for all pollutants using this method meet all NAAQS, no further modeling analyses need to be performed.

TABLE III-6 : Maximum Predicted Impacts with Background

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 ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
$PM_{2.5}$	24-hour	**1.56**	522.600	5054.450	151.42	**17**	**18.56**	**35**
NO_2	1-hour	**46.25**	523.000	5053.600	181.74	**43**	**89.25**	**188**

E. Increment

AERMOD-PRIME refined modeling was performed to predict the maximum Class II increment impacts. Thermogen did not exist during the 1987 or 1977 baseline years, so their emissions are considered to be entirely increment consuming. In addition, Thermogen conservatively assumed no credit would be taken from any other area sources that existed during the baseline years.

Results of the Class II increment analysis are shown in Table III-7. All modeled maximum increment impacts were below all increment standards. Because all predicted increment impacts meet increment standards, no further Class II increment modeling needed to be performed.

TABLE III-7 : Class II Increment Consumption

Pollutant	Averaging Period	Max Impact ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)	Receptor UTM E (km)	Receptor UTM N (km)	Receptor Elevation (m)
SO_2	3-hour	0.020	**512**	523.000	5053.600	181.74
	24-hour	0.004	**91**	522.600	5054.450	151.42
	Annual	0.001	**20**	522.830	5055.280	115.15
PM_{10}	24-hour	1.56	**30**	522.600	5054.450	151.42
	Annual	0.07	**17**	522.830	5055.280	115.15
$PM_{2.5}$	24-hour	1.56	**9**	522.600	5054.450	151.42
	Annual	0.07	**4**	522.830	5055.280	115.15
NO_2	Annual	0.25	**25**	522.830	5055.280	115.15

As part of the increment analysis, impacts that would occur as a direct result of the general, commercial, residential, industrial and mobile-source growth associated with the construction and operation of a source were evaluated as follows:

GENERAL GROWTH: Some increases in local emissions due to construction related activities are expected to occur for several months, with the majority of emissions due to truck traffic (soil removal, concrete delivery/pouring, delivery of materials, etc.). Increases in potential emissions of NO_x due to commuting by construction workers will likely be temporary and short-lived. Emissions of dust from construction related activities will be minimized by the use of "Best Management Practices" for construction on-site.

RESIDENTIAL, COMMERCIAL AND INDUSTRIAL GROWTH: Population growth in the impact area of the proposed source can be used as a surrogate factor for the growth in emissions from residential combustion sources. Construction of Thermogen is expected to create approximately 25 new full-time jobs. The manpower requirements, operations and support required for the construction and operation of Thermogen will, for the most part, be available from the surrounding communities. It is expected that no new significant residential, commercial and industrial growth will follow from the modification associated with this source.

MOBILE SOURCE AND AREA SOURCE GROWTH: Since area and mobile sources are considered minor sources of NO_2, their contribution to increment has to be considered. Technical guidance from USEPA points out that screening procedures can be used to determine whether additional detailed analyses of minor source emissions are required. Compiling a minor source inventory may not be required if it can be shown that little or no growth has taken place in the impact area of the proposed source since the baseline dates (1977/1988) were established. Very little growth has taken place in the area of Thermogen since the baseline dates were established. In addition, no increase in Vehicle Miles

Travelled (VMT) is expected as a result of the modification. No further analyses of mobile or area source growth are needed.

F. Summary

In summary, it has been demonstrated that Thermogen will not cause or contribute to a violation of any NAAQS for SO_2, PM_{10}, $PM_{2.5}$, NO_2 or CO; or any SO_2, PM_{10}, $PM_{2.5}$ or NO_2 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, and
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants Air Emission License A-1072-77-2-A subject to the conditions found in Air Emission License A-1072-77-1-N and in the following conditions.

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 (16)(I) in air emission license A-1072-77-1-N:

(16) **Torrefication Process**

I. Stack #1 shall be at least 125 feet above ground level. [06-096 CMR 115, BACT]

DONE AND DATED IN AUGUSTA, MAINE THIS 22 DAY OF May , 2013.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Mara Allen Robert Cove for
PATRICIA W. AHO, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: February 5, 2013
Date of application acceptance: February 6, 2013

Date filed with the Board of Environmental Protection:

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