STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

DEPARTMENT ORDER

Exeter Agri-Energy, LLC **Penobscot County** **Exeter, Maine** **A-1047-71-G-A**	**Departmental** **Findings of Fact and Order** **Air Emission License** **Amendment #1**

FINDINGS OF FACT

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 Maine Revised Statutes (M.R.S.) § 344 and § 590, the Maine Department of Environmental Protection (Department) finds the following facts:

I. REGISTRATION

A. Introduction

Exeter Agri-Energy, LLC (EAE) was issued Air Emission License A-1047-71-F-R/M on February 20, 2018, for the operation of emission sources associated with their anaerobic digesters and electric co-generation facility.

The equipment addressed in this license amendment is located at 226 Fogler Rd, Exeter, Maine.

In addition to the currently licensed scenario of generating biogas for combustion in on-site cogeneration units, EAE has proposed an additional operational scenario to upgrade biogas from the anaerobic digesters to pipeline quality and convert it to compressed natural gas to supply to the natural gas pipeline. To facilitate this additional operational scenario, EAE has requested an amendment to their license in order to make the following changes:

1. Install Boilers #1 and #2;
2. Install a compressed natural gas upgrader system to process biogas into compressed natural gas (CNG);
3. Install another anaerobic digester vessel (AD #4) and Flare #3; and
4. Add a 300,000 gallon mixing tank (MT3).

B. Emission Equipment

The following new equipment is addressed in this air emission license amendment:

Boilers

Equipment	Max. Capacity (MMBtu/hr)	Maximum Firing Rate	Fuel Type	Date of Manuf.	Date of Install.	Stack #
Boiler #1	6.0	5,882 scf/hr*	Natural Gas	TBD	TBD	Blr #1
Boiler #2	6.0	5,882 scf/hr*	Natural Gas	TBD	TBD	Blr #2

* based on a heating value of 1,020 Btu/scf for natural gas

Flare

Equipment	Max. Capacity (MMBtu/hr)	Maximum Firing Rate	Fuel Type	Date of Manuf.	Date of Install.	Stack #
Flare #3	Approx. 18.92	~31,534 scf/hr*	Biogas	TBD	TBD	N/A

* based on a heating value of 600 Btu/scf for biogas

Process Equipment

Emission Unit ID	Equipment	Capacity (gallons)	Process Rate	Pollution Control Equipment	Stack #
CNG Upgrader	Compressed Natural Gas Upgrader System	TBD	1,500 scf/min	Activated carbon adsorber system	N/A
AD #4*	Anaerobic Digester	2,200,000	--	CNG Upgrader, Cogeneration Units #1, #2, and #3, Flares #1, #2, and #3	N/A
MT3**	Mixing Tank	300,000	--	--	N/A

* EAE plans to install another anaerobic digester vessel, specified as AD #4, which will have a diameter of approximately 145 feet, a height of 20 feet, resulting in a capacity of approximately 2.2 million gallons of digestate. AD #4 will be covered with a flexible bladder to collect the biogas, which will be used in the CNG Upgrader, burned in the cogeneration units, or, if necessary, vented to Flare #3. Emissions from AD #4 are accounted for in one of these three processes.

** EAE plans to install Mixing Tank #3 (MT3), which will be a new 300,000-gallon tank. MT3 will be used for mixing and temporary storage of waste materials prior to introduction to the AD vessels. MT3 will be covered to minimize odors and will only be heated to prevent the materials from freezing; therefore, biogas generation is negligible. MT3 is considered an insignificant emissions unit under *Major and Minor Source Air Emission License Regulations,* 06-096 Code of Maine Rules (C.M.R.) ch. 115, Appendix B, Section B.1 and will not be addressed further.

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

Existing Cogeneration Engines

Equipment	Max. Capacity (MMBtu/hr)	Maximum Firing Rate	Fuel Type	Date of Manuf.	Date of Install.	Stack #
Cogeneration Unit #1	9.93	16,550 scf/hr	Biogas	2010	2011	#1
Cogeneration Unit #2	9.63	16,056 scf/hr	Biogas	2015	2016	#2
Cogeneration Unit #3	9.63	16,056 scf/hr	Biogas	2017	2017	#3

Existing Flares

Equipment	Max. Capacity (MMBtu/hr)	Maximum Firing Rate	Fuel Type	Date of Manuf.	Date of Install.	Stack #
Flare #1	Approx. 5	~9,000 scf/hr	Biogas	2010	2011	N/A
Flare #2	Approx. 5	~9,000 scf/hr	Biogas	2010	2011	N/A

C. Definitions

Type 1 Waste. As defined in *Definitions Regulation*, 06-096 C.M.R. ch. 100, rubbish, mixture of combustible waste such as paper, cardboard cartons, wood scrap, foliage, and combustible floor sweepings, from domestic, commercial, and industrial activities. The mixture contains up to 20% by weight of restaurant or cafeteria waste, but contains little or no treated papers, plastic, or rubber wastes. This type of waste contains about 25% moisture and 10% incombustible solids and has a heating value of approximately 6,500 BTU per pound as fired.

Type 3 Waste As defined in 06-096 C.M.R. ch. 100, garbage, consisting of animal and vegetable wastes from restaurants, cafeterias, hotels, hospitals, markets and like installations. This type of waste contains up to 70% moisture, and up to 5% incombustible solids and has a heating value of approximately 2,500 Btu/lb as fired.

D. Application Classification

All rules, regulations, or statutes referenced in this air emission license refer to the amended version in effect as of the date this license was issued.

The modification of a minor source is considered a major or minor modification based on whether or not expected emission increases exceed the "Significant Emissions" levels as defined in the Department's *Definitions Regulation*, 06-096 C.M.R. ch. 100. The emission increases are determined by subtracting the current licensed annual emissions preceding the modification from the maximum future licensed annual emissions, as follows:

Pollutant	Current License (tpy)	Future License (tpy)	Net Change (tpy)	Significant Emission Levels
PM	15.5	15.9	0.4	100

Pollutant	Current License (tpy)	Future License (tpy)	Net Change (tpy)	Significant Emission Levels
PM_{10}	15.5	14.8	-0.7	100
$PM_{2.5}$	--	14.8	14.8*	100
SO_2	49.2	46.7	-2.5	100
NO_x	42.4	41.5	-0.9	100
CO	75.7	73.9	-1.8	100
VOC	29.5	28.1	-1.4	100

* Previous license did not address $PM_{2.5}$ emissions. This license amendment includes the $PM_{2.5}$ emission limits, which is why the net change of $PM_{2.5}$ emissions from the previous license indicates an increase of 14.8 tpy.

This modification is determined to be a minor modification and has been processed as such.

E. Facility Classification

The facility is licensed as follows:

- As a natural minor source of criteria pollutants, because no license restrictions are necessary to keep facility emissions below major source thresholds for criteria pollutants; and
- As an area source of hazardous air pollutants (HAP), because the licensed emissions are below the major source thresholds for HAP.

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 C.M.R. ch. 100. Separate control requirement categories exist for new and existing equipment.

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 C.M.R. ch. 100. BACT is a top-down approach to selecting air emission controls considering economic, environmental, and energy impacts.

B. Facility Background

EAE operates in partnership with Stonyvale Farms, Inc. (Stonyvale). Stonyvale is a dairy farm with approximately 1,200 milking head equivalents[1]. EAE currently operates three

[1] A milking head equivalent is used to quantify the amount of cow manure from the farm. Each milking head equivalent represents one full-sized cow, and calves will represent a percentage of a milking head equivalent according to their age, since they produce less manure.

anaerobic digester vessels (ADs) producing biogas fuel to power combined heat and electric cogeneration units. EAE operates the ADs to digest cow manure, food wastes, and other Type 1 wastes, as well as Type 3 wastes such as glycerin which is a byproduct of biodiesel production. The glycerin is collected from various producers throughout New England. EAE maintains a Solid Waste Facility License from the Department's Bureau of Remediation and Waste Management to accept off-site wastes. The system generates biogas to produce electrical and thermal energy. Effluent material is run through a solids-separator whereby the solid fraction is used as livestock bedding, and the liquid fraction is land-applied as a nutrient-rich organic fertilizer.

One of the three original digesters, AD #2, was planned to be converted to operate as a "hydrolyzer," which was discussed in A-1047-71-F-R/M (2/20/2018). However, AD #2 was never converted to a hydrolyzer and still operates as an anaerobic digester. There is no plan to convert it at this time. Any future plans to convert an aerobic digester shall be addressed in a license amendment prior to beginning construction of the conversion.

EAE is proposing to modify their current system to increase biogas production and to upgrade the produced biogas to compressed natural gas (CNG), which is known interchangeably as renewable natural gas (RNG). As part of this project, EAE will install a biogas upgrader system to produce CNG, which is designed to take 1,500 scf/min of biogas, enough to accommodate the existing and proposed anaerobic digesters. The CNG will be loaded to tube trailers, which are semi-trailers that consist of high-pressure tanks, and will be used as RNG. As part of this project, EAE is proposing to install a fourth digester vessel, AD #4, and add a 300,000-gallon tank, MT3, for mixing and temporary storage of incoming materials. EAE has proposed to install Boiler #1 and Boiler #2 to provide supplemental heat to the digesters to ensure they operate at optimal temperature for biogas production. Cogeneration Units #1, #2, and #3 will each take an annual capacity factor limit of 95% to offset the combined emissions of Boilers #1 and #2 to keep licensed $PM_{2.5}$ emissions below the level that may trigger ambient air quality modeling requirements.

Each digester is equipped with a flare to control digester emissions during periods when the cogeneration units are unavailable. The existing flares are designated as Flare #1 and Flare #2. These units were upgraded by installing an improved blower system to enhance combustion characteristics, which is addressed in A-1047-71-F-R/M (2/20/2018). Flare #3, which will be larger than the other two flares, will be installed to control emissions from AD #4.

EAE has extensive redundancy in their system to deal with changes in gas use and prevent overpressure in the gas collection system. However, the system also has pressure relief valves that can vent biogas to the atmosphere in the event of an unforeseen situation causing excessive gas pressure. However, this scenario is very unlikely: The anaerobic digesters each have a substantial volume of gas storage capacity inside their respective membranes, and EAE has three cogeneration units and backup flares, giving the biogas burn-off system extensive redundancy. EAE shall report any instances when any of the

digesters vent biogas to the atmosphere within 48 hours of the occurrence. Records shall include the time, date, and duration that the digester vented biogas and an estimate of the volume of biogas vented.

In addition to the cogeneration units, EAE owns and operates one small stationary diesel engine. Stonyvale Farm operates 2 diesel engines and a propane fired generator which are listed in EAE's Air Emission License because the two facilities are located on adjacent property and operate in partnership. The units operated by Stonyvale would otherwise be below licensing thresholds. Generator #1 is a 125 kWe emergency generator (1.3 MMBtu/hr input). Sawmill Diesel Drive Unit is a 166 bhp (1.5 MMBtu/hr input) direct drive unit used to power a small sawmill located on-site. The Booster Generator owned by EAE is a 39 kWe emergency generator (0.65 MMBtu/hr input). Calf Barn Generator is a propane-fired generator rated at 39 kWe (0.65 MMBtu/hr input). These units are addressed in A-1047-71-F-R/M (2/20/2018), and are mentioned for completeness purposes only.

C. Cogeneration Units #1, #2, and #3 (Capacity Factor Limits)

EAE operates Cogeneration Units #1, #2, and #3 to generate electricity. The engines fire biogas produced by the Anaerobic Digester vessels. In Air Emission License A-1047-71-F-R/M (2/20/2018), Cogeneration Units #1, #2, and #3 were each licensed to operate 8,760 hours per year at maximum rated capacity of 1 megawatt of electrical generation (MWe). In order to offset the combined emissions from Boilers #1 and #2 to keep licensed $PM_{2.5}$ emissions below the level that may trigger ambient air quality modeling requirements, EAE has requested to limit the operation of each cogeneration unit to 95% capacity factor (5% reduction from unrestricted annual operating capacity). Per EPA definitions, Capacity Factor (CF) is the fraction of an electric generating unit's (EGU's) total available capacity that is utilized over a period of time, expressed as a fraction. EAE proposes to track monthly energy production for each unit and base the 95% capacity factor limit on a 12-month rolling average. Compliance with this operational limit shall be demonstrated through the records of operation of each cogeneration unit, which EAE is already required to maintain. For each unit, the following formula will be used to calculate CF, as a percentage:

(Actual MW-hrs / month / max unit Capacity (MW) * total hrs / month) * 100%)

D. Digester Flares

The proposed anaerobic digester, AD #4, will utilize Flare #3 to control the digester gases when the cogeneration units and the CNG Upgrader are not available. Flare #3 has an approximate maximum design capacity of 18.92 MMBtu/hr and fires biogas. Flares #1 and #2, which are used by the existing AD vessels when the three cogeneration units and the CNG Upgrader are not available, each has an approximate design capacity of 5 MMBtu/hr. The total flare capacity for Flares #1, #2, and #3 will not exceed the total design capacity of the cogeneration units (28.9 MMBtu/hr). The flares are designed to combust all biogas from the digesters and associated structures during emergency or maintenance periods. By

flaring the biogas, the resulting emissions are safer and more environmentally protective than if the biogas were vented uncontrolled. Additional benefits include a reduction in odor, the destruction of VOC, and the conversion of hydrogen sulfide (H_2S) to sulfur dioxide (SO_2), which would not occur in the event of uncontrolled, direct venting.

1. BACT and BPT Findings

The emission factors for industrial flares as listed in AP-42 Table 13.5-1 (02/18) are lower than the emission factors for the cogeneration units in terms of pounds per million Btu; therefore, the addition of Flare #3 will not result in an increase in emissions for any pollutant compared to operation of the cogeneration units.

The BACT emission limits for Flare #3 (new) and BPT emission limits for Flares #1 and #2 were based on the following:

Biogas

$PM/PM_{10}/PM_{2.5}$	-	0.12 lb/MMBtu based on 06-096 C.M.R. ch. 115, BACT and BPT
SO_2	-	conversion of 1,400 ppm of H_2S and all of the sulfur from the three engines going to the flares (3.81 lb/hr +3.7 lb/hr +3.7 lb/hr)
NO_X	-	0.068 lb/MMBtu: AP-42, Table 13.5-1 dated 2/18
CO	-	0.31 lb/MMBtu: AP-42, Table 13.5-2 dated 2/18
VOC	-	0.14 lb/MMBtu: AP-42, Table 13.5-1 dated 2/18
Visible Emissions	-	06-096 C.M.R. ch. 115, BACT and BPT

Emissions from each flare shall not exceed the following:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.12	06-096 C.M.R. ch. 115, BACT and BPT

Emissions from all three flares combined shall not exceed the following [06-096 C.M.R. ch. 115, BACT and BPT]:

PM (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
3.47	3.47	3.47	11.21	1.97	8.97	4.05

Visible emissions from each flare shall not exceed 10% opacity on a six-minute block average basis. [06-096 C.M.R. ch. 115, BACT and BPT]

2. Periodic Monitoring

For each flare, EAE shall maintain a written or electronic log of when the flare is in operation, for how long, and for what reason. Acceptable records indicating flare

operation may include, but are not limited to, relevant parameters such as flare temperature or flare gas fuel flow readings recorded by the computer control system. [A-1047-71-D-A (10/23/2013), BACT]

E. Boilers #1 and 2

EAE proposes to install Boilers #1 and #2 to provide supplemental heat to the digesters for biogas production. The two boilers will be identical units and operated as a redundant pair: Only one unit will be operated at a time except during periods of transition from one to the other or during unusual load demands such as extreme cold weather. EAE is proposing a fuel limit of 51.5 million standard cubic feet per year for the two boilers combined, equivalent to the fuel used for continuous operation of one boiler for an entire year, thereby ensuring that the redundant operation of two boilers will not result in emissions greater than the potential to emit of either unit individually.

Boilers #1 and #2 will each be a hydronic hot water heater rated at 6.0 MMBtu/hr and will each fire natural gas. Boilers #1 and #2 will exhaust through their own stacks, Blr #1 and Blr #2, respectively. Each stack will have an above-ground height of 30 feet, an inside diameter of 1.17 feet, an exit temperature of approximately 230 ^{o}F, and a design exhaust flow rate of 29 ft^3/s. EAE proposes to install the boilers by spring of 2025. Their dates of manufacture will be 2024 or newer.

1. BACT Findings

Following is a BACT analysis for control of emissions from Boilers #1 and #2.

a. Particulate Matter (PM, PM_{10}, $PM_{2.5}$)
EAE has proposed to burn only low-ash content fuel (natural gas) in Boilers #1 and #2 and to optimize combustion conditions using oxygen trim systems. An oxygen (O_2) trim system monitors the O_2 content in the exhaust gas and automatically adjusts the fuel valve or air damper to optimize the air-to-fuel ratio in combustion. Additional add-on pollution controls are not economically feasible.

BACT for $PM/PM_{10}/PM_{2.5}$ emissions from Boilers #1 and #2 is the use of an oxygen trim system and the emission limits listed in the tables below.

b. Sulfur Dioxide (SO_2)
EAE has proposed to fire only natural gas. The use of this fuel results in minimal emissions of SO_2, and additional add-on pollution controls are not economically feasible.

BACT for SO_2 emissions from Boilers #1 and #2 is the use of natural gas and the emission limits listed in the tables below.

c. Nitrogen Oxides (NO_x)

EAE considered several control strategies for the control of NO_x including Selective Catalytic Reduction (SCR), Selective Non-Catalytic Reduction (SNCR), water/steam injection, flue gas recirculation (FGR), low-NO_x burners, and use of oxygen trim systems.

Both SCR and SNCR are technically feasible control technologies for minimizing NO_x. Both methods include injection of a NO_x reducing agent, typically ammonia or urea, into the boiler combustion gases, where the reagent reacts with NO_x to form nitrogen and water. Each technology is effective within a specific temperature range, 500 – 1,200 °F for SCR and 1,400 – 1,600 °F for SNCR. However, both SCR and SNCR have the negative environmental impact of emissions of unreacted ammonia. In addition, due to the initial capital cost and the annual operating costs, these systems are typically only considered cost effective for units larger than Boilers #1 and #2.

Water/steam injection and FGR can attain similar NO_x reduction efficiencies through lowering burner flame temperature and thereby reducing thermal NO_x formation. However, both control strategies reduce the boiler's fuel efficiency.

The use of low-NO_x burners and an oxygen trim system has been determined to be feasible and has been selected as part of the BACT strategy.

BACT for NO_x emissions from Boilers #1 and #2 is the use of low-NO_x burners, an oxygen trim system, and the emission limits listed in the tables below.

d. Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)

EAE considered several control strategies for the control of CO and VOC including oxidation catalysts, thermal oxidizers, and use of an oxygen trim system.

Oxidation catalysts and thermal oxidizers both have high capital, maintenance, and operational costs considering the size of the boiler in question. These controls were determined to be economically infeasible.

The use of an oxygen trim system has been determined to be feasible and has been selected as part of the BACT strategy for Boilers #1 and #2.

BACT for CO and VOC emissions from Boilers #1 and #2 is the use of an oxygen trim system to optimize combustion and the emission limits listed in the tables below. The oxygen trim system shall be operated, maintained, and calibrated in accordance with manufacturer recommendations.

e. Emission Limits

The BACT emission limits for Boilers #1 and #2 were based on the following:

Natural Gas

PM/ PM_{10}/$PM_{2.5}$	–	0.05 lb/MMBtu based on 06-096 C.M.R. ch. 115, BACT
SO_2	–	0.6 lb/MMscf based on AP-42 Table 1.4-2 dated 7/98
NO_x	–	50 lb/MMscf based on AP-42 Table 1.4-1 dated 7/98
CO	–	84 lb/MMscf based on AP-42 Table 1.4-1 dated 7/98
VOC	–	5.5 lb/MMscf based on AP-42 Table 1.4-2 dated 7/98
Visible Emissions	–	06-096 C.M.R. ch. 101

The BACT emission limits for Boilers #1 and #2 are the following:

Unit	Pollutant	lb/MMBtu
Boiler #1	PM	0.05
Boiler #2	PM	0.05

Unit	PM (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Boiler #1	0.30	0.30	0.30	0.004	0.29	0.49	0.03
Boiler #2	0.30	0.30	0.30	0.004	0.29	0.49	0.03

EAE shall be limited to firing a combined total 51.5 MMscf/yr of natural gas in Boilers #1 and #2, on a calendar year total basis.

2. Visible Emissions

Visible emissions from Boilers #1 and #2 shall each not exceed 10% opacity on a six-minute block average basis.

3. Periodic Monitoring

Periodic monitoring for Boilers #1 and #2 shall include recordkeeping to document fuel use both on a monthly and calendar year total basis. [06-096 C.M.R. ch. 115, BACT]

EAE shall demonstrate compliance with the visible emission limit for Boilers #1 and #2 by conducting observations in accordance with 40 C.F.R. Part 60, Appendix A, Method 9 upon request of the Department. [06-096 C.M.R. ch. 101 § 3(B)]

4. New Source Performance Standards (NSPS): 40 C.F.R. Part 60, Subpart Dc

   Due to their size, the Boilers #1 and #2 are not subject to *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units* 40 C.F.R. Part 60, Subpart Dc for units greater than 10 MMBtu/hr manufactured after June 9, 1989. [40 C.F.R. § 60.40c]

5. National Emission Standards for Hazardous Air Pollutants (NESHAP): 40 C.F.R. Part 63, Subpart JJJJJJ

   Boilers #1 and #2 are not subject to 40 C.F.R. Part 63, Subpart JJJJJJ. Boilers #1 and #2 are natural gas-fired boilers, and gas-fired boilers are exempt from 40 C.F.R. Part 63, Subpart JJJJJJ. [40 C.F.R. §§ 63.11193 and 63.11195]

F. Compressed Natural Gas Upgrader

Biogas produced from anaerobic digestion is composed of methane (CH_4), CO_2, H_2S, water vapor, and trace amounts of other gases. Biogas contains a range of 50-75% CH_4, which is the primary component of natural gas.[2] EAE proposes to install a CNG Upgrader to convert the biogas from the AD vessels (AD #1, #2, #3, and #4) into compressed natural gas (CNG), which is known interchangeably as renewable natural gas (RNG). The biogas is treated to remove moisture, H_2S and other impurities prior to passing through the upgrader. The CO_2 removed from the CNG by the upgrader is known as tail gas, and is vented to the atmosphere.

The H_2S produced from anaerobic digestion can lead to fouling of the CNG Upgrader's membrane as well as to contamination of the CNG produced. Therefore, the biogas will be pretreated to remove H_2S, discussed in the BACT Findings below. The pretreated biogas will pass through a dryer to remove water vapor, which will be returned to the AD vessels for reuse. The biogas will then be pressurized and passed through a size-selective membrane, which allows methane (RNG) to pass through while separating out carbon dioxide (CO_2). The CO_2 is vented to the atmosphere, and the RNG is sent to tube trailers for transport.

1. BACT Findings

   a. Pollutants
   CO_2 is a regulated pollutant, but it is specifically excluded from minor New Source Review in accordance with 06-096 C.M.R. ch. 100, § 150(H).

   H_2S is a regulated pollutant pursuant to 06-096 C.M.R. ch. 100, § 150(B), because there are several New Source Performance Standards that contain standards for

[2] https://www.epa.gov/agstar/how-does-anaerobic-digestion-work

H_2S. EAE has proposed to use adsorption to remove H_2S from the biogas before it is treated in the CNG Upgrader.

b. Adsorption

Adsorption is a non-destructive control technology used to remove pollutants from low- to medium-concentration gas streams. Adsorbers are used in a wide range of applications, such as controlling VOC and HAP emissions from storage tanks and process vents at refineries, chemical manufacturing, and pulp and paper facilities. Adsorption is also used to control H_2S and VOC emissions from municipal wastewater plants.

Adsorption occurs when gas molecules passing through a bed of solid particles are selectively held on the surface of the solid by attractive forces. There are four types of adsorption equipment: fixed regenerable beds; disposable/rechargeable canisters; moving bed adsorbers; and fluid-bed adsorbers.

Fixed regenerable beds are used for controlling continuous, VOC-laden streams over a wide range of flow rates. The VOC concentration can be as low as several parts per billion by volume (ppbv) to as high as 25% of the VOC's lower explosive limit (LEL).[3] Fixed regenerable beds may be operated in either intermittent or continuous modes. Fixed regenerable beds can be desorbed at the site.

Disposable/rechargeable canisters, or canister units, are normally limited to controlling low volume and intermittent gas streams. Gas streams from storage tank vents are ideal for this type of adsorption equipment for that reason. The carbon canisters are not designed for in situ desorption, but are either returned to the manufacturer or regenerated at a desorption facility onsite. Once the carbon reaches a certain pollutant content, the unit is shut down so that the canister can be replaced. Each canister unit consists of a vessel, activated carbon, an inlet to the carbon bed, and an outlet to the exhaust stack.

Moving bed adsorbers are made up of a permanent adsorber vessel where the waste gases or vapors are brought into contact with the adsorbent. The adsorbent is typically held in two beds placed on coaxial rotating cylinders. The pollutants are adsorbed as the waste gas flows between the two beds. As the cylinders are rotated, the spent adsorbent outside the waste gas stream is regenerated.

Fluid-bed adsorbers use counter-flow to replace the spent adsorbent. The waste gas typically enters the adsorber vessel from the bottom and flows up. The regenerated adsorbent is fed in through the top of the vessel and slowly migrates to the bottom of the vessel. The adsorbent becomes saturated as it migrates and is collected at the bottom and then transferred to a regeneration chamber.

[3] LEL is the lowest concentration of a gas or vapor in the air that is required to facilitate its combustion.

There are three types of typical adsorbents used: activated carbon, synthetic zeolites, and polymers. Activated carbon, which is the most commonly used adsorbent, can be modified to improve adsorption of H_2S. It is also the least costly adsorbent of the three. Zeolites are uniform crystalline structures with uniform pores, also called molecular sieves since their pores trap molecules of specific sizes. Polymers, which are granules or beads of long-chain resins with high surface area and pore structure designed to target the molecules to be adsorbed, have specific surface areas that are higher than those of activated carbon and zeolites.

c. Activated Carbon Adsorber System

EAE has proposed to install a VALOPACK activated carbon adsorber system (ACAS), which will consist of two sets of activated carbon media (canister units) operated in parallel. Each canister unit consists of two vessels operated in series. EAE will use continuous analyzers to monitor H_2S levels in the gas coming in and out of each canister unit and in between the vessels to optimize timing for media replacement, such that when H_2S from one of the canister units measures above 10 ppmdv, the operator is notified. This will allow ample time to replace the media in the first vessel before the second vessel reaches saturation. The biogas will keep flowing through the other canister unit while the saturated unit is shut down and the activated carbon media is replaced. Bypass is done manually by the operator. Once the media in the first tank is replaced, the operator will manually change the valves of the canister units, so that the second canister unit is the first unit, and vice versa. This will allow the canister unit with the newly activated carbon media to be in the second position to run once the other canister unit becomes saturated. Note that the canister unit sets are operated in parallel, so the timing of the carbon replacement in one set may or may not correspond with the carbon replacement in the other set. The outlet gas from the ACAS as a whole is also monitored, and if the H_2S level is greater than 10 ppmdv for 90 minutes, the system will automatically shut down. There is a particulate filter to capture any carbon dust that escapes the ACAS, which is located at the ACAS outlet and before the upgrader membranes inlet.

The Department finds that BACT for H_2S emissions from the tail gas from AD #1, #2, #3, and #4 to be the use of the ACAS and an emission limit of 10 ppmdv H_2S from the ACAS outlet on a 12-month rolling average basis. The ACAS is equipped with continuous H_2S analyzers to indicate when carbon filter replacement is required. Compliance with the H_2S ppmdv limit shall be demonstrated based on the monthly average of the continuous H_2S analyzers or equivalent. The continuous H_2S analyzer or equivalent shall be operated, calibrated, and maintained in accordance with the manufacturer's specifications. Calibration and maintenance records, along with the date, time, and monitored concentration shall be documented in a log and made available to the Department upon request.

At least annually, EAE shall test the gas exiting the ACAS outlet three times during a single day using ASTM Test Method D5504, or other method(s) as approved by the Department, to analyze for H_2S and total sulfur. Concurrent with the annual test,

measurements of H_2S shall be taken with the continuous H_2S analyzer or equivalent. If the results of the continuous H_2S analyzer or equivalent sampling do not correspond within reasonable accuracy (+/- 1 ppmdv) to the annual test results, EAE shall take corrective action, such as reassess/replace/recalibrate the continuous H_2S analyzer or equivalent as appropriate to obtain valid sampling results.

For the monthly and annual H_2S sampling required by this license, EAE shall develop a written, site-specific monitoring plan that addresses methods and equipment used, data collection, and the quality assurance and quality control elements. The monitoring plan shall be submitted to the Department and approved by the Department prior to startup of the CNG Upgrader.

EAE shall calculate and record the estimated mass emissions of H_2S emitted from the CNG Upgrader to the atmosphere on a monthly basis. Emissions shall be based on the monthly average measurements from the continuous H_2S analyzer or equivalent of the H_2S concentration exiting the ACAS and gas flow rates.

2. Periodic Monitoring

EAE shall keep records for the following periodic monitoring for the ACAS:

a. H_2S concentration (ppmdv) entering the ACAS logged at least monthly;
b. H_2S concentration (ppmdv) exiting the ACAS on a monthly and 12-month rolling total average basis;
c. Amount of biogas (scf) sent to the ACAS each month;
d. Monthly average measurements of H_2S taken with the continuous H_2S analyzer or equivalent;
e. Date, time, duration, and reason for any downtime of the ACAS;
f. Date, time, duration, and reason for any period of time when the ACAS is out of service; and
g. Records of any maintenance activities performed (planned or unplanned) on the ACAS.

G. Emission Statements

EAE is subject to emissions inventory requirements contained in *Emission Statements*, 06-096 C.M.R. ch. 137. EAE shall maintain the following records in order to comply with this rule:

1. The amount of biogas fired in Cogeneration Units #1, #2, and #3 (each) on a monthly basis;
2. The amount of distillate fuel fired in Generator #1, the Booster Generator, and the Sawmill Diesel Driver Unit (each) on a monthly basis;
3. The amount of propane fuel fired in the Calf Barn Generator, on a monthly basis;

4. The sulfur content of the distillate fuel fired in Generator #1, the Booster Generator, and the Sawmill Diesel Drive Unit;
5. The amount of natural gas fired in Boilers #1 and #2 on a monthly basis; and
6. Hours each emission unit was active or operating on a monthly basis.

Every third year, or as requested by the Department, EAE shall report to the Department emissions of hazardous air pollutants as required pursuant to 06-096 C.M.R. ch. 137, § (3)(C). The next report is due no later than May 15, 2027, for emissions occurring in calendar year 2026. The Department will use these reports to calculate and invoice for the applicable annual air quality surcharge for the subsequent three billing periods. EAE shall pay the annual air quality surcharge, calculated by the Department based on these reported emissions of hazardous air pollutants, by the date required in Title 38 M.R.S. § 353-A(3). [38 M.R.S. § 353-A(1-A)]

H. Annual Emissions

The table below provides an estimate of facility-wide annual emissions for the purposes of calculating the facility's annual air license fee and establishing the facility's potential to emit (PTE). Only licensed equipment is included, i.e., emissions from insignificant activities are excluded. Similarly, unquantifiable fugitive particulate matter emissions are not included except when required by state or federal regulations. Maximum potential emissions were calculated based on the following assumptions:

- Operating Cogeneration Units #1, #2, and #3 to 95% capacity (each);
- Operating Generator #1, the Calf Barn Generator, and the Booster Generator for 100 hr/yr (each);
- Operating the Sawmill Diesel Driver Unit for 200 hr/yr; and
- Firing no more than 51.5 MMscf/year of natural gas in Boilers #1 and #2 combined, on a calendar year basis.

This information does not represent a comprehensive list of license restrictions or permissions. That information is provided in the Order section of this license.

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

	PM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	VOC
Cogeneration Unit #1	5.0	5.0	5.0	15.9	13.5	24.3	9.5
Cogeneration Unit #2	4.8	4.8	4.8	15.4	13.1	23.6	9.2
Cogeneration Unit #3	4.8	4.8	4.8	15.4	13.1	23.6	9.2
Generator #1	--	--	--	--	0.1	0.1	--
Sawmill Diesel Drive Unit	--	--	--	--	0.3	0.1	0.1
Calf Barn Generator	--	--	--	--	0.1	--	--

	PM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	VOC
Booster Generator	--	--	--	--	--	--	--
Boilers #1 and #2, combined	1.3	0.2	0.2	--	1.3	2.2	0.1
Total TPY	**15.9**	**14.8**	**14.8**	**46.7**	**41.5**	**73.9**	**28.1**

Pollutant	Tons/year
Single HAP	9.9
Total HAP	24.9

III. AMBIENT AIR QUALITY ANALYSIS

The level of ambient air quality impact modeling required for a minor source is determined by the Department on a case-by case basis. In accordance with 06-096 C.M.R. ch. 115, an ambient air quality impact analysis is not required for a minor source if the total licensed annual emissions of any pollutant released do not exceed the following levels and there are no extenuating circumstances:

Pollutant	Tons/Year
PM_{10}	25
$PM_{2.5}$	15
SO_2	50
NO_x	50
CO	250

The total licensed annual emissions for the facility are below the emission levels contained in the table above and there are no extenuating circumstances; therefore, an ambient air quality impact analysis is not required as part of this license amendment.

This determination is based on information provided by the applicant regarding the expected construction and operation of the proposed and licensed emission units. If the Department determines that any parameter (e.g., stack size, configuration, flow rate, emission rates, nearby structures, etc.) deviates from what was included in the application, the Department may require EAE to submit additional information and may require an ambient air quality impact analysis at that time.

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 Amendment A-1047-71-G-A subject to the conditions found in Air Emission License A-1047-71-F-R/M and the following conditions.

Severability. The invalidity or unenforceability of any provision of this License Amendment or part thereof shall not affect the remainder of the provision or any other provisions. This License Amendment 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 be added to Specific Condition (16)(A) of Air Emission License A-1047-71-F-R/M. Specific Condition (16)(A)(1)-(4) is restated for clarity and completeness:

(16) **Cogeneration Units #1, #2, and #3**

A. The cogeneration units shall fire biogas. [06-096 C.M.R. ch. 115, BACT]

1. Emissions from each Cogeneration Unit #1, #2, and #3 shall not exceed the following:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.12	06-096 C.M.R. ch. 115, BACT

2. Emissions from each Cogeneration Units #1, #2, and #3 shall not exceed the following [06-096 C.M.R. ch. 115, BACT]:

Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Cogeneration Unit #1	1.19	1.19	3.81	3.25	5.85	2.28
Cogeneration Unit #2	1.16	1.16	3.7	3.15	5.68	2.21
Cogeneration Unit #3	1.16	1.16	3.7	3.15	5.68	2.21

3. Visible emissions from each Cogeneration Unit #1, #2, and #3 shall not exceed 20% opacity on a six (6) minute block average basis. [06-096 C.M.R. ch. 115, BACT]

4. The stack for each Cogeneration Unit #1, #2, and #3 shall be a minimum of 20 feet in height above ground level. [06-096 C.M.R. ch. 115, BPT]

5. EAE shall be limited to operation of Cogeneration Units #1, #2, and #3 to no greater than 95% capacity factor. Cogen Units #1, #2, and #3 are each rated at 1 MWe capacity. EAE will track monthly energy production for each unit and base the 95% capacity factor limit on a 12-month rolling average. Compliance with this limit shall be demonstrated through the records of operation of each cogeneration unit. For each unit, the following formula will be used to calculate CF, as a percentage:

   (Actual MW-hrs / month / max unit Capacity (MW) * total hrs / month) * 100%)

   [06-096 C.M.R. ch. 115, BPT]

The following shall replace Specific Condition (17) of Air Emission License A-1047-71-F-R/M:

(17) **Digester Flares (Flares #1, #2, and #3)**

A. The flares (total 29.2 MMBtu/hr heat input) shall fire biogas and shall be operated when the associated cogeneration unit is off-line. [A-1047-71-D-A (10/23/13), BPT for Flares #1 and #2; 06-096 C.M.R. ch. 115, BACT for Flare #3]

B. Emissions from each flare shall not exceed the following:

Pollutant	lb/MMBtu	Origin and Authority
PM	0.12	06-096 C.M.R. ch. 115, BACT and BPT

C. Emissions from all flares combined shall not exceed the following: [06-096 C.M.R. ch. 115, BACT and BPT]

PM (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
3.47	3.47	3.47	11.21	1.97	8.97	4.05

D. Visible emissions from each flare shall not exceed 10% opacity on a six-minute block average basis. [06-096 C.M.R. ch. 115, BACT and BPT]

E. Records shall be maintained indicating the date, time, and duration of each flare's operations, including reasons for each operating period. Such records may be in the form of a written or electronic log. Acceptable records indicating operating status

include, but are not limited to, relevant parameters such as flare temperature or flare gas fuel flow readings recorded by the computer control system.
[A-1047-71-D-A (10/23/13, BPT) for Flares #1 and #2; 06-096 C.M.R. ch. 115, BACT for Flare #3]

The following shall replace Specific Condition (22) of Air Emission License A-1047-71-F-R/M:

(22) **Annual Emission Statements**

A. In accordance with *Emission Statements*, 06-096 C.M.R. ch. 137, EAE shall annually report to the Department, in a format prescribed by the Department, the information necessary to accurately update the State's emission inventory. The emission statement shall be submitted as specified by the date in 06-096 C.M.R. ch. 137.

B. EAE shall keep the following records in order to comply with 06-096 C.M.R. ch. 137:

1. The amount of biogas fired in Cogeneration Units #1, #2, and #3 (each) on a monthly basis;
2. The amount of distillate fuel fired in Generator #1, the Booster Generator, and the Sawmill Diesel Driver Unit (each) on a monthly basis;
3. The amount of propane fired in the Calf Barn generator, on a monthly basis;
4. The sulfur content of the distillate fuel fired in Generator #1, the Calf Barn Generator, the Booster Generator, and the Sawmill Diesel Driver Unit;
5. The amount of natural gas fired in Boilers #1 and #2 on a monthly basis; and
6. Hours each emission unit was active or operating on a monthly basis.

[06-096 C.M.R. ch. 137]

C. Every third year, or as requested by the Department, EAE shall report to the Department emissions of hazardous air pollutants as required pursuant to 06-096 C.M.R. ch. 137, § (3)(C). The next report is due no later than May 15, 2027, for emissions occurring in calendar year 2026. EAE shall pay the annual air quality surcharge, calculated by the Department based on these reported emissions of hazardous air pollutants, by the date required in Title 38 M.R.S. § 353-A(3).
[38 M.R.S. § 353-A(1-A)]

The following are new Specific Conditions:

(24) **Anaerobic Digestors #1, #2, #3, and #4**

EAE shall report any instances when any of the digesters vent biogas to the atmosphere within 48 hours of the occurrence. Records shall include the time, date, duration, and reason that the digester vented biogas and an estimate of the volume of biogas vented.
[06-096 C.M.R. ch. 115, BPT and BACT]

(25) **Boilers #1 and #2**

A. Fuel

1. Total fuel use for Boilers #1 and #2 shall not exceed a combined total 51.5 MMscf/yr of natural gas in Boilers #1 and #2, on a calendar year total basis. [06-096 C.M.R. ch. 115, BACT]
2. Records of annual fuel use shall be kept on a monthly and calendar year basis. [06-096 C.M.R. ch. 115, BACT]

B. Boilers #1 and #2 shall use low-NO_x burners and an oxygen trim system to optimize combustion. The oxygen trim system shall be operated, maintained, and calibrated in accordance with manufacturer recommendations. [06-096 C.M.R. ch. 115, BACT]

C. Emissions from Boilers #1 and #2 shall not exceed the following:

Emission Unit	Pollutant	lb/MMBtu	Origin and Authority
Boiler #1	PM	0.05	06-096 C.M.R. ch. 115, BACT
Boiler #2	PM	0.05	06-096 C.M.R. ch. 115, BACT

D. Emissions from Boilers #1 and #2 shall not exceed the following [06-096 C.M.R. ch. 115, BACT]:

Emission Unit	PM (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Boiler #1	0.30	0.30	0.30	0.004	0.29	0.49	0.03
Boiler #2	0.30	0.30	0.30	0.004	0.29	0.49	0.03

E. Visible emissions from Boilers #1 and #2 shall not exceed 10% opacity on a six-minute block average basis. [06-096 C.M.R. ch. 101, § 4(A)(3)]

F. EAE shall demonstrate compliance with the visible emission limit for Boilers #1 and #2 by conducting observations in accordance with 40 C.F.R. Part 60, Appendix A, Method 9 upon request of the Department. [06-096 C.M.R. ch. 101 § 3(B)]

(26) **Compressed Natural Gas Upgrader**

A. EAE shall operate an activated carbon adsorption system (ACAS) to limit H_2S emissions from ACAS to the CNG Upgrader to 10 ppmdv or less, monitored using continuous H_2S analyzers, on a 12-month rolling average basis. This limit applies at all times. [06-096 C.M.R. ch. 115, BACT]

B. Compliance with the H_2S ppmdv limit shall also be demonstrated through monthly average measurements of the H_2S in the gas exiting the ACAS outlet using a continuous H_2S analyzer or equivalent. Calibration and maintenance records, along with the date,

time, and monitored concentration shall be documented in a log and made available to the Department upon request. [06-096 C.M.R. ch. 115, BACT]

C. The continuous H_2S analyzer or equivalent shall be operated, calibrated, and maintained in accordance with the manufacturer's specifications. [06-096 C.M.R. ch. 115, BACT]

D. At least annually, EAE shall test the gas exiting the ACAS outlet three times during a single day using ASTM Test Method D5504, or other method as approved by the Department, to analyze for H_2S and total sulfur. [06-096 C.M.R. ch. 115, BACT]

E. Concurrent with the annual test, measurements of H_2S shall be taken with the continuous H_2S analyzer or equivalent. If the results of the continuous H_2S analyzer or equivalent sampling do not correspond within reasonable accuracy to the annual test results, EAE shall take corrective action, such as reassess/replace/recalibrate the continuous H_2S analyzer or equivalent as appropriate to obtain valid sampling results. Reasonable accuracy is within 10% (+/- 1 ppmdv) of the annual test results. [06-096 C.M.R. ch. 115, BACT]

F. For the monthly and annual H_2S sampling required by this license, EAE shall develop a written site-specific monitoring plan that addresses methods and equipment used, date of sampling, and the quality assurance and quality control elements. The monitoring plan shall be submitted to the Department and approved by the Department prior to startup of the CNG Upgrader. [06-096 C.M.R. ch. 115, BACT]

G. EAE shall keep records of any maintenance activities performed (planned or unplanned) on the ACAS. [06-096 C.M.R. ch. 115, BACT]

H. EAE shall calculate and record the estimated mass emissions of H_2S emitted from the CNG Upgrader to the atmosphere on a monthly basis. Emissions shall be based on the monthly average measurements from the continuous H_2S analyzer or equivalent of the H2S concentration exiting the ACAS and gas flow rates. [06 096 C.M.R. ch. 115, BACT]

I. EAE shall keep records for the following periodic monitoring for the ACAS:

1. H_2S concentration (ppmdv) entering the ACAS on a monthly basis;
2. H_2S concentration (ppmdv) exiting the ACAS on a monthly and 12-month rolling total average basis;
3. Monthly average measurements of H_2S taken with the continuous H_2S analyzer or equivalent;
4.
5. Amount of biogas (scf) sent to the ACAS each month;
6. Date, time, duration, and reason for any downtime of the ACAS;

7. Date, time, duration, and reason for any period of time when the ACAS is out of service; and
8. Records of any maintenance activities performed (planned or unplanned) on the ACAS.

[06 096 C.M.R. ch. 115, BACT]

(27) If the Department determines that any parameter value pertaining to construction and operation of the emissions units, including but not limited to stack size, configuration, flow rate, emission rates, nearby structures, etc., deviates from what was submitted in the application or ambient air quality impact analysis for this air emission license, EAE may be required to submit additional information. Upon written request from the Department, EAE shall provide information necessary to demonstrate AAQS will not be exceeded, potentially including submission of an ambient air quality impact analysis or an application to amend this air emission license to resolve any deficiencies and ensure compliance with AAQS. Submission of this information is due within 60 days of the Department's written request unless otherwise stated in the Department's letter.
[06-096 C.M.R. ch. 115, § 2(O)]

DONE AND DATED IN AUGUSTA, MAINE THIS 9th DAY OF SEPTEMBER, 2024.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: _____ for _____
MELANIE LOYZIM, COMMISSIONER

The term of this license amendment shall be ten (10) years from the issuance of Air Emission License A-1047-71-F-R/M (issued 2/20/2018).

[Note: If a renewal application, determined as complete by the Department, is submitted prior to expiration of this license, then pursuant to Title 5 M.R.S. § 10002, all terms and conditions of the license shall remain in effect until the Department takes final action on the license renewal application.]

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: April 17, 2022
Date of application acceptance: April 22, 2024

Date filed with the Board of Environmental Protection:

This Order prepared by Kendra Nash, Bureau of Air Quality.

FILED

SEP 09, 2024

State of Maine
Board of Environmental Protection