Lewiston Auburn Water Pollution Control Authority
Androscoggin County
Lewiston, Maine
A-1054-71-E-A

Departmental
Findings of Fact and Order
Air Emission License
Amendment #4

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

I. REGISTRATION

A. Introduction

Lewiston Auburn Water Pollution Control Authority (LAWPCA) was issued Air Emission License A-1054-71-A-N on June 1, 2011, permitting the operation of emission sources associated with their anaerobic digester and cogeneration facility. The license was subsequently amended on May 20, 2013 (A-1054-71-B-M), February 20, 2014 (A-1054-71-C-A) and on October 14, 2014 (A-1054-71-D-M)

LAWPCA has requested an amendment to their license in order to replace the engine in the combined heat and power Cogeneration Unit #1 with a like-kind engine due to a catastrophic failure of the original engine.

The equipment addressed in this license is located at 535 Lincoln Street, Lewiston, Maine.

B. Emission Equipment

The following equipment is addressed in this air emission license:

Fuel Burning Equipment

Equipment	Maximum Capacity (MMBtu/hr)	Maximum Firing Rate (scf/hr)	Fuel Type	Date of Manuf.	Stack #
Cogeneration Unit #1 replacement engine (230 kW)	2.23	4055	biogas	2015	1
		2186	nat'l gas backup		

C. Application Classification

The modification of a minor source is considered a major or minor modification based on whether or not expected emission increases exceed the "Significant Emission" levels as defined in the Department's *Definitions Regulation*, 06-096 CMR 100 (as amended). The emission increases are determined by subtracting the current licensed annual emissions preceding the modification from the maximum future licensed annual emissions. The licensed emissions from the Cogeneration Unit #1 engine replacement are not proposed to be revised from the currently licensed emissions.

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

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. Engine Replacement

LAWPCA operates two cogeneration units that fire biogas produced from an anaerobic digester cogeneration system and natural gas as backup fuel. On June 29, 2015, the engine in Cogeneration Unit #1 failed catastrophically when the #3 cylinder rod exited the engine block. The unit was immediately shut down and locked out.

A replacement engine has been proposed by LAWPCA, with the same manufacturer and model as the original. The performance characteristics and emissions are expected to be the same as was originally licensed in A-1054-71-A-N (issued June 1, 2011) for Cogeneration Unit #1.

The replacement engine is a 230 kW reciprocating unit (2.23 MMBt/hr. 308 hp) and will fire biogas produced by the anaerobic digesters with natural gas as the back-up fuel.

NSPS Applicability
The replacement engine is subject to the New Source Performance Standards (NSPS) 40 CFR Part 60, Subpart JJJJ, *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*. The applicability for the engine is under the category of engines manufactured on or after July 1, 2008 with a maximum engine power less than 500 hp (§60.4230(a)(4)(iii)). The engine is required to be certified to the standards of Subpart JJJJ, Table 1, either by manufacturer certification or performance testing.

NESHAP Applicability
The replacement engine is subject to 40 CFR Part 63, Subpart ZZZZ, *National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines*. The engine is considered a new stationary reciprocating internal combustion engine at an area HAP source (construction commenced on or after June 12, 2006); however, since the unit is subject to 40 CFR Part 60, Subpart JJJJ there are no further requirements under 40 CFR Part 63, Subpart ZZZZ (§63.6590(c)(1)).

1. BACT

LAWPCA submitted a BACT analysis as part of the license application for the original engine in 2011. There have been no substantial emission control technology advances for this type and size engine since the original BACT analysis. The BACT analysis for the replacement engine is the same as the original engine and is summarized below.

PM/PM_{10}– The options for controlling particulate matter from the engine include add-on controls and good operating practices. Add on-controls were not considered. The anaerobic digester system includes gas cleaning using a particulate filter to remove particulate matter from the biogas prior to combustion. The engine has fuel and air filters which further remove particulates and improve engine performance and reliability. These filters, the inherent combustion efficiencies of a new unit, and good operating practices are BACT. The PM emission limit for the engine was based on emission factors obtained from the San Diego Air Pollution Control District (27.6 lb/$MMft^3$ for biogas and 10.19 lb/$MMft^3$ for natural gas).

The BACT emission limits for PM and PM_{10} from the engine is the following:

PM and PM_{10} lb/hr Emission Limits

	Biogas	Natural Gas
PM	0.11	0.02
PM_{10}	0.11	0.02

SO_2 – Sulfur dioxide emissions result from the combustion oxidation of hydrogen sulfide (H_2S) and possibly other reduced sulfur compounds formed through the reduction of sulfates by anaerobic bacteria within the digester. Sulfates occur naturally in wastewater through the decomposition of urine and protein in the influent sludge. H_2S removal systems include chemical treatment such as the addition of ferric chloride to the digesters or flow-through systems that utilize iron-oxide impregnated wood chip media (iron sponge system). The iron sponge technology is considered a proven technology in the wastewater industry. When biogas comes into contact with iron sponge media, a chemical reaction with the oxides effectively removes the hydrogen sulfide from the biogas. After the biogas passes through the media, a stable iron sulfide compound remains on the wood chips. The iron sponge media is housed in large corrosion resistant vessels (stainless steel or reinforced fiberglass) and disposed of as a non-hazardous waste.

The use of the iron sponge biogas treatment system is BACT, with the SO_2 emission limit for the engine based on data provided by the engine manufacturer.

The BACT emission limit for SO_2 from the engine is the following:

SO_2 lb/hr Emission Limits

	Biogas	Natural Gas
SO_2	0.02	0.002

NO_X – NO_X emissions from internal combustion engines are primarily reduced either by combustion controls such as design modifications to improve air and fuel mixing, Ignition Timing Retard, lean burn and air to fuel adjustment, exhaust gas recirculation, water or steam injection, and combustion of biogas fuel; or by using control systems such as selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR).

SCR is an add-on control which uses urea or ammonia injection along with a catalyst to react with the NO_X in the flue gas to form water and nitrogen. SCR catalysts have improved significantly and are in use in some diesel fueled engines.

However, SCR technologies are not generally used for biogas-fueled engines primarily due to the poisoning of the catalyst by the various compounds found in digester or landfill gas. In several California Air Districts, use of SCR in landfill gas fueled engines is experimental and there are no known stable, long-term operations of SCR on similar waste gas systems in practice. Therefore, SCR was not considered technologically feasible for LAWPCA.

SNCR is an add-on control which also uses ammonia or urea injection, but without a catalyst. The reaction requires the injection point at a specific temperature (1600-2100°F), which is above the expected exhaust temperature for the LAWPCA generators, therefore SNCR was not considered feasible for the facility.

Exhaust gas recirculation, where exhaust gas is recirculated back to the combustion chamber, reduces NO_X formation by lowering peak temperature and lowering the oxygen concentration slightly. Although exhaust gas recirculation has been applied to internal combustion engines, the available data shows a reduction of fuel efficiency and only marginal NO_X reduction. At this time, no manufacturers are offering exhaust gas recirculation on gas-fired engines.

Firing biogas fuel can be considered a part of a NO_X emissions reduction control strategy. Biogas has large amounts of CO_2, causing peak engine temperatures to be reduced, and thereby minimizing NO_X formation. This is a viable method to reducing NO_X from the generators.

Lean burn combustion engines are designed to be operated at high excess air levels resulting in lower combustion temperatures and therefore lower NO_X emissions. Lean burn combustion simultaneously minimizes emissions of NO_X along with PM, CO, and VOC. Lean burn technology for digester gas-fired internal combustion engines is widely utilized. LAWPCA is proposing to use a lean burn technology generator.

Ignition timing retard delays the ignition timing to minimize peak combustion temperature. NO_X formation can be greatly reduced, but CO and PM emissions potentially increase, along with a decrease in engine performance and operational stability. Most engine manufacturers use ignition timing retard to some degree, including the engines proposed to be utilized by LAWPCA.

Proper operation and good combustion and maintenance practices minimize emissions for all pollutants including NO_X. LAWPCA will maintain the anaerobic digesters and the generators in accordance with the manufacturers' written instruction for proper operation and maintenance.

The use of biogas fuel, lean burn combustion technology, ignition timing retard tuning, proper operation, and good combustion and maintenance practices are BACT for the engine to minimize NO_X emissions, with the NO_X emission limit for the generators based on data provided by the engine manufacturer.

The BACT emission limit for NO_X from the engine is the following:

NO_X lb/hr Emission Limits

	Biogas	Natural Gas
NO_X	0.93	1.36

CO – The options for controlling carbon monoxide from engines include good combustion control and an add-on oxidation catalyst. Add on-controls were not considered. The inherent combustion efficiencies of a new lean burn unit and good operating practices were proposed as BACT, with the CO emission limit for the engine based on data provided by the engine manufacturer.

The BACT emission limit for CO from the engine is the following:

CO lb/hr Emission Limits

	Biogas	Natural Gas
CO	1.88	2.72

VOC – Control options for volatile organic compound emissions from engines include good combustion control and an add-on oxidation catalyst. Add on-controls were not considered. The inherent combustion efficiencies of a new lean burn unit and good operating practices were proposed as BACT, with the VOC emission limit for the generators based on emission factors obtained from the San Diego Air Pollution Control District (77.76 lb/$MMft^3$ for biogas and 120.36 lb/$MMft^3$ for natural gas).

The BACT emission limit for VOC from the engine is the following:

VOC lb/hr Emission Limits

	Biogas	Natural Gas
VOC	0.32	0.26

Opacity – Visible emissions from the Cogeneration Unit #1 stack shall not exceed 10% opacity on a 6 minute block average, except for no more than two (2) six (6) minute block averages in a 3 hour period.

Greenhouse Gases – Current and developing EPA and US Department of Energy guidance includes the use of biogas or biomass as alternative fuels to be considered for facilities with power generation and combustion. Overall methane emissions from LAWPCA will be reduced by the operation of the digester and the firing of biogas in the cogeneration engine. The operation of the anaerobic digester system and cogeneration can be considered part of LAWPCA's greenhouse gas emissions control strategy.

Periodic Monitoring

LAWPCA shall continue to maintain records of the hours of operation of each Cogeneration Unit on a monthly and 12 month rolling total: Cogeneration Unit #1, with the replacement engine, and the existing Cogeneration Unit #2.

Performance monitoring for the iron sponge media shall continue to be a monthly grab sample of biogas at the outlet of the iron sponge treatment unit for H_2S using a Draeger Tube or other method approved by the Department to monitor the performance of the iron sponge. The iron sponge treatment unit is located after the digesters and prior to the inlet to the Cogeneration Units. The iron sponge technology media shall be replaced within 30 days after test results show breakthrough of H_2S (5 ppm). Records shall be maintained of each grab sample result and dates of when the media is replaced.

2. 40 CFR Part 60, Subpart JJJJ Requirements
The federal regulation 40 CFR Part 60, Subpart JJJJ, *Standards of Performance for Spark Ignition Internal Combustion Engines (SI ICE)* is applicable to the engine since the unit was ordered after June 12, 2006 and manufactured after January 1, 2009. LAWPCA shall meet the applicable 40 CFR Part 60, Subpart JJJJ requirements which are summarized, in part, below.

   a. Emission Standards
   The engine shall meet the emission standards contained in 40 CFR Part 60, Subpart JJJJ, Table 1 per §60.4231(e) and §60.4233(e), as follows:

Engine Type and Fuel	**Maximum Engine Power**	**Manufacture Date**	**Emission Standards***					
			g/hp-hr			**ppmvd at 15% O_2**		
			NO_X	CO	VOC**	NO_X	CO	VOC**
Non-emergency SI Natural Gas	100≤hp<500	1/1/2011	1.0	2.0	0.7	82	270	60
Landfill/Digester Gas	hp<500	1/1/2011	2.0	5.0	1.0	150	610	80

* Owners and operators of stationary non-certified engines may choose to comply with the emission standards in units of either g/hp-hr or ppmvd at 15% O_2.

** When calculating emissions of volatile organic compounds, emissions of formaldehyde should not be included.

b. Certification Requirement
The engine shall be certified by the manufacturer as meeting the emission standards for new nonroad spark ignition engines found in 40 CFR Part 60, Subpart JJJJ, Table 1 or by an initial performance test if a manufacturer certification is unavailable per §60.4243(b).

c. Operation and Maintenance Requirement
If the engine is certified through an initial performance test, the facility must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions per §60.4243(b).

d. Recordkeeping
Per §60.4245, LAWPCA shall keep records that include all notifications submitted to comply with 40 CFR Part 60, Subpart JJJJ and all documentation supporting any notification; maintenance conducted on the engine; and documentation from the manufacturer that the engine is certified to meet the emission standards and information as required in 40 CFR Parts 90, 1048, 1054, and 1060, as applicable, if the engine is a certified engine and if the engine is not certified, documentation that the engine meets the emission standards. If the engine is subject to the initial performance test, a copy of the performance test as conducted per §60.4244 shall be submitted within 60 days after the test has been completed.

C. Annual Emissions

LAWPCA's annual emissions will not be changing with the installation of the replacement engine in Cogeneration Unit #1.

1. LAWPCA shall be restricted to the following annual emissions, based on a 12 month rolling total. The tons per year limits were calculated based on the cogeneration units and boilers operating 8760 hrs/year, and the Emergency Generator operating at 100 hrs/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
Cogeneration Units	0.98	0.98	0.18	11.91	23.83	2.76
Boilers	0.16	0.16	0.07	2.06	1.73	0.11
Emergency Generator	0.04	0.04	0.0005	1.0	0.3	0.03
Total TPY	**1.18**	**1.18**	**0.25**	**14.97**	**25.86**	**2.9**

*Note: Tons per year calculations were based on a worst case scenario, as follows:

- the cogeneration units and boilers firing 8760 hr/yr (the flare is not included since it will be operated when the generators and boilers are not functioning; the flare has the same or lower emissions as the other units),
- the cogeneration units' PM, SO_2, and VOC emissions were based on biogas firing and NO_X and CO were based on natural gas firing,
- the boilers' PM, SO_2, NO_X, CO, and VOC emissions were all based on firing biogas, and
- the Emergency Generator emissions were based on operating 100 hrs/year.

2. Greenhouse Gases

Greenhouse gases are considered regulated pollutants as of January 2, 2011, through 'Tailoring' revisions made to EPA's *Approval and Promulgation of Implementation Plans,* 40 CFR Part 52, Subpart A, §52.21 Prevention of Significant Deterioration of Air Quality rule. Greenhouse gases, as defined in 06-096 CMR 100 (as amended), are the aggregate group of the following gases: Carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. For licensing purposes, greenhouse gases (GHG) are calculated and reported as carbon dioxide equivalents (CO_2e).

Based on the facility's fuel use limit(s), the worst case emission factors from AP-42, IPCC (Intergovernmental Panel on Climate Change), and *Mandatory Greenhouse Gas Reporting*, 40 CFR Part 98, and the global warming potentials contained in 40 CFR Part 98, LAWPCA is below the major source threshold of 100,000 tons of CO_2e per year. Therefore, no additional licensing requirements are needed to address GHG emissions at this time.

III. AMBIENT AIR QUALITY ANALYSIS

The level of ambient air quality impact modeling required for a minor source shall be determined by the Department on a case-by case basis. In accordance with 06-096 CMR 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
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.

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-1054-71-E-A subject to the conditions found in Air Emission License A-1054-71-A-N, in amendments A-1054-71-B-M, A-1054-71-C-A, and A-1054-71-D-M, and 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) in Air Emission License A-1054-71-A-N including revisions addressed in amendments A-1054-71-B-M and A-1054-71-D-M:

(16) **Cogeneration Units**

A. Cogeneration Unit #1 and #2 (2.23 MMBtu/hr each) shall fire biogas or natural gas. [06-096 CMR 115, BPT]

B. LAWPCA may replace the original engine in Cogeneration Unit #1 with a like-kind engine of the same size, model, and manufacturer. [06-096 CMR 115, BACT]

C. Emissions from each of the cogeneration units shall not exceed the following [06-096 CMR 115, BPT]:

Fuel	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
Biogas	0.11	0.11	0.02	0.93	1.88	0.32
Nat'l Gas	0.02	0.02	0.002	1.36	2.72	0.26

D. Visible emissions from each cogeneration unit stack shall not exceed 10% opacity on a six (6) minute block average, except for no more than two (2) six (6) minute block averages in a continuous 3-hour period. [06-096 CMR 101]

E. Each cogeneration unit stack shall be a minimum of 17 feet in height. [06-096 CMR 115, BACT]

F. LAWPCA shall keep records of the hours of operation of each of the cogeneration units on a monthly and 12 month rolling total basis. [06-096 CMR 115, BACT]

G. LAWPCA shall test a grab sample of biogas at the outlet of the iron sponge treatment unit for H_2S every month to monitor the performance of the iron sponge media, using a Draeger Tube or other method approved by the Department. The media in the iron sponge technology shall be replaced within 30 days after test results show breakthrough of H_2S (5 ppm). Records shall be maintained of the grab sample results and dates of when the media is replaced. [06-096 CMR 115, BACT]

H. 40 CFR Part 60, Subpart JJJJ

LAWPCA shall meet all applicable requirements of 40 CFR Part 60, Subpart JJJJ for the cogeneration units, including:

1. Emission Limits
   The engines shall meet the emission standards contained in 40 CFR Part 60, Subpart JJJJ, Table 1 as follows [40 CFR Part 60, Subpart JJJJ, §60.4231(e) and §60.4233(e)]:

Engine Type and Fuel	Maximum Engine Power	Manufacture Date	Emission Standards*					
			g/hp-hr			ppmvd at 15% O_2		
			NO_X	CO	VOC**	NO_X	CO	VOC**
Non-emergency SI Natural Gas	100≤hp<500	1/1/2011	1.0	2.0	0.7	82	270	60
Landfill/Digester Gas	hp<500	1/1/2011	2.0	5.0	1.0	150	610	80

* Owners and operators of stationary non-certified engines may choose to comply with the emission standards in units of either g/hp-hr or ppmvd at 15% O2.

** When calculating emissions of volatile organic compounds, emissions of formaldehyde should not be included.

2. Certification Requirement
   The engines shall be certified by the manufacturer as meeting the emission standards for new nonroad spark ignition engines found in 40 CFR Part 60, Subpart JJJJ, Table 1 or by an initial performance test if a manufacturer certification is unavailable. [40 CFR Part 60, Subpart JJJJ, §60.4243(b)]

3. Operation and Maintenance Requirement
   If the engines are certified through an initial performance test, the facility must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. [40 CFR Part 60, Subpart JJJJ, §60.4243(b)]

4. Recordkeeping
   LAWPCA shall keep records that include all notifications submitted to comply with 40 CFR Part 60, Subpart JJJJ and all documentation supporting any notification; maintenance conducted on the engine; and documentation from the manufacturer that the engine is certified to meet the emission standards and information as required in 40 CFR Parts 90, 1048, 1054, and 1060, as applicable, if the engine is a certified engine and if the engine is not certified, documentation that the engine meets the emission standards. If the engine is subject to the initial

performance test, a copy of the performance test as conducted per §60.4244 shall be submitted within 60 days after the test has been completed. [40 CFR Part 60, Subpart JJJJ, §60.4245]

DONE AND DATED IN AUGUSTA, MAINE THIS 3 DAY OF November , 2015.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Marc Allen Robert Cyr for
AVERY T. DAY, ACTING COMMISSIONER

The term of this amendment shall be concurrent with the term of Air Emission License A-1054-71-A-N.

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: August 24, 2015
Date of application acceptance: August 25, 2015

Date filed with the Board of Environmental Protection:

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