



Connecticut Department of  
**ENERGY &  
ENVIRONMENTAL  
PROTECTION**

**BUREAU OF AIR MANAGEMENT  
NEW SOURCE REVIEW PERMIT  
TO CONSTRUCT AND OPERATE A STATIONARY SOURCE**

Issued pursuant to Title 22a of the Connecticut General Statutes (CGS) and Section 22a-174-3a of the Regulations of Connecticut State Agencies (RCSA).

<b>Owner/Operator</b>	Waterbury Generation, LLC
<b>Address</b>	P.O. Box 1149, Waterbury, CT 06721-1149
<b>Equipment Location</b>	160 Washington Avenue, Waterbury, CT 06708
<b>Equipment Description</b>	GE LMS100 PA Simple Cycle Combustion Turbine
<b>Town-Permit Numbers</b>	192-0300
<b>Premises Number</b>	0005
<b>Stack Number</b>	4
<b>Revision Issue Date</b>	August 9, 2019
<b>Prior Permit Issue Dates</b>	August 29, 2008 (Original) July 20, 2009 (Revision) April 4, 2010 (Modification)
<b>Expiration Date</b>	None

/s/Tracy Babbidge  
Betsey C. Wingfield  
Deputy Commissioner

8/9/2019  
Date

This permit specifies necessary terms and conditions for the operation of this equipment to comply with state and federal air quality standards. The Permittee shall at all times comply with the terms and conditions stated herein.

## **PART I. DESIGN SPECIFICATIONS**

### **A. General Description**

Waterbury Generation, LLC operates a General Electric LMS 100 PA simple cycle combustion turbine generator. The GE LMS100 PA turbine will generate a nominal capacity of 96 megawatts of power using natural gas and ultra low sulfur kerosene (ULSK) fuels and highly efficient control equipment.

### **B. Equipment Design Specifications**

1. Turbine
  - a. Maximum Firing Rate:
    - i. Natural Gas: 846,723 ft<sup>3</sup>/hr
    - ii. ULSK: 6,100 gal/hr
  - b. Maximum Gross Heat Input:
    - i. Natural Gas: 886.5 MMBtu/hr
    - ii. ULSK: 838.4 MMBtu/hr

### **C. Control Equipment Design Specifications**

1. Water Injection for the Turbine
2. Selective Catalytic Reduction (SCR)
  - a. Make and Model: Haldor Topsoe – Model DNX-629 or equivalent
  - b. Catalyst Type: Corrugated fiber-reinforced titanium-dioxide (TiO<sub>2</sub>) or equivalent
3. Oxidation Catalyst
  - a. Make and Model: Emerachem or equivalent
  - b. Catalyst Type: ADCAT or equivalent

### **D. Stack Parameters**

1. Minimum Stack Height: 125 ft above base elevation
2. Minimum Exhaust Gas Flow Rate at 100% load:
  - a. Natural Gas: 820,182 acfm
  - b. ULSK: 780,650 acfm
3. Minimum Stack Exit Temperature at 100% load:
  - a. Natural Gas: 723 °F
  - b. ULSK: 746 °F
4. Minimum Distance from Stack to Nearest Property Line: 33 ft

## PART II. OPERATIONAL CONDITIONS

### A. Turbine

1. Turbine
  - a. Fuel Types: Natural Gas, Ultra Low Sulfur Kerosene (ULSK)
  - b. Maximum Natural Gas Consumption over any Consecutive 12 Month Period: 7,417 MMft<sup>3</sup>
  - c. Maximum ULSK Consumption over any Consecutive 12 Month Period: 4.203 MM gallons
  - d. Maximum ULSK Sulfur Content (% by weight, dry basis): 0.0015
2. In addition, the turbine may only be fueled by ULSK when:
  - a. The interruptible natural gas supply is curtailed;
  - b. There is a failure of the equipment required to allow the turbine to utilize natural gas;
  - c. The turbine is starting up, or commissioning or testing the ULSK firing capability of the turbine;
  - d. There is routine maintenance of any equipment required to allow the turbine to utilized natural gas or ULSK;
  - e. As required, periodically to maintain an appropriate turnover of the on-site fuel oil inventory as recommended by any of the equipment manufacturers or as otherwise required by prudent utility practice; or
  - f. Otherwise required to comply with the requirements of the Master Agreement for Generation Projects between Waterbury Generation LLC and the United Illuminating Company, dated as of May 21, 2007, as approved by the Connecticut department of Public Utility Control.

## PART III. CONTINUOUS EMISSION MONITORING REQUIREMENTS AND ASSOCIATED EMISSION LIMITS

The Permittee shall comply with the CEM requirements as set forth in RCSA §22a-174-4, RCSA §22a-174-22e, 40 CFR Part 60 Subpart KKKK and 40 CFR Parts 72-78, if applicable. CEM shall be required for the following pollutant/operational parameters and enforced on the following basis:

Pollutant/Operational Parameter	Averaging Times	Emission Limit
Opacity <sup>1</sup>	six minute block	10%
NO <sub>x</sub>	4 hour rolling	See Part V
CO	1 hour block	See Part V
CO <sub>2</sub>	1 hour block	None <sup>2</sup>
NH <sub>3</sub>	1 hour block	See Part V
Temperature <sup>3</sup>	Continuous	None <sup>2</sup>
Fuel Flow	Continuous	See Part I
Turbine Load	Continuous	See Part V

<sup>1</sup> Required during ULSK firing only.

<sup>2</sup> Parameter to be monitored is not limited by conditions of this permit. Monitoring is required solely to provide basis for correction of actual exhaust gas conditions @15% O<sub>2</sub> by volume.

<sup>3</sup> SCR operating temperature and Oxidation Catalyst inlet temperature.

## **PART IV. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS**

### **A. Monitoring**

1. The Permittee shall use a non-resettable totalizing fuel metering devices or a billing meter to continuously monitor fuel feed to this permitted source.
2. The Permittee shall continuously monitor and continuously record the SCR ammonia injection rate (lb/hr), operating temperature (°F) and pressure drop (inches of water) across the catalyst bed. The Permittee shall maintain these parameters within the ranges recommended by the manufacturer to achieve compliance with the emission limits in this permit.
3. The Permittee shall continuously monitor and continuously record the oxidation catalyst inlet temperature (°F). The Permittee shall maintain this parameter within the range recommended by the manufacturer to achieve compliance with the emission limits in this permit.
4. The Permittee shall inspect the SCR and oxidation catalysts. Inspection criteria will be as recommended by the manufacturer's operation and maintenance plan.

### **B. Record Keeping**

1. The Permittee shall keep records of monthly and consecutive 12 month fuel consumption (for each fuel). The consecutive 12 month fuel consumption shall be determined by adding (for each fuel) the current month's fuel consumption to that of the previous 11 months. The Permittee shall make these calculations within 30 days of the end of the previous month.
2. The Permittee shall calculate and record the monthly and consecutive 12 month PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, CO and VOC emissions in units of tons. The consecutive 12 month emissions shall be determined by adding (for each pollutant) the current month's emissions to that of the previous 11 months. Such records shall include a sample calculation for each pollutant. The Permittee shall make these calculations within 30 days of the end of the previous month.

Emissions during startup and shutdown shall be counted towards the annual emission limitation in Part V.D of this permit.

3. The Permittee shall make and keep records of start-up and shut-down events. Such records shall contain the following information:
  - a. Date of start-up or shut-down event,
  - b. Fuel being used during start-up or shut-down event,
  - c. Duration of start-up or shut-down event (hr),
  - d. Type of start-up or shut-down event as listed in Part V.C of this permit, and
  - e. Total NO<sub>x</sub> and CO emissions emitted (lb) during the start-up or shut-down event.
4. The Permittee shall make and keep records of the emissions of this turbine during the initial shakedown period. Emission during shakedown shall be calculated using good engineering judgement and best data and methodology available for estimating such emissions. Emissions during shakedown shall be counted towards the source's annual emission limitation in Part V.D of this permit.

5. The Permittee shall make and keep records of the fuel certification for each delivery of fuel from a bulk petroleum provider or a copy of the current contract with the fuel supplier supplying the fuel used by the equipment that includes the applicable sulfur content of the fuel as a condition of each shipment. The shipping receipt or contract shall include:
  - a. Date of delivery,
  - b. Name of the fuel supplier,
  - c. Type of fuel delivered,
  - d. Percentage of sulfur in such fuel, by weight, dry basis, and
  - e. The method used to determine the sulfur content of such fuel.
6. The Permittee shall records of all exceedances of any emissions limits or operating parameter contained in this permit. Such records shall include:
  - a. The date and time of the exceedance;
  - b. A detailed description of the exceedance; and
  - c. The duration of the exceedance.
7. The Permittee shall make and keep records of the inspection and maintenance of the SCR and oxidation catalysts. The records shall include the name of the person, the date, the results or actions and the date the catalyst is replaced.
8. The Permittee shall keep records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of the stationary gas turbine; any malfunction of the air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is inoperative. [40 CFR §60.7(b)]
9. The Permittee shall keep all records required by this permit for a period of no less than five years and shall submit such records to the commissioner upon request.

### **C. Reporting**

1. The Permittee shall submit a report of exceedance to the commissioner within 30 days of the end of the previous month. Such report shall include the following:
  - a. Copies of the exceedance records for the month, as recorded in Part IV.B.6 of this permit,
  - b. An explanation of the likely causes of the exceedances, and
  - c. An explanation of remedial actions taken to correct the exceedance.
2. The Permittee shall notify the commissioner in writing of any emergency or malfunction of the equipment described in this permit. The Permittee shall submit such notification within seven days of the emergency or malfunction. The notification shall include the following:
  - a. a description of the emergency or malfunction and a description of the circumstances surrounding the cause or likely cause of such emergency or malfunction; and
  - b. a description of all corrective actions and preventive measures taken and/or planned with respect to such emergency or malfunction and the dates of such actions and measures.

## PART V. ALLOWABLE EMISSION LIMITS

The Permittee shall not exceed the emission limits stated herein at any time as determined in accordance with the applicable averaging periods defined in Part III of this permit or as specified in an approved stack test protocol except during periods of startup, shutdown and malfunction. Emissions during these periods shall be counted towards the annual emission limits stated herein.

An exceedance of either (i) the emission limits in the tables below, or (ii) the emissions limits developed for this permit due to an emergency, malfunction, or cleaning shall not be deemed a “Federally Permitted Release,” as that term is used in 42 U.S.C. 9601(10).

### A. Steady State Natural Gas

#### 1. Criteria Pollutants Emission Rates

Pollutant	lb/hr	ppmvd @ 15% O <sub>2</sub>	Basis
PM <sub>10</sub> / PM <sub>2.5</sub> (total) <sup>1</sup>	8.4		1
SO <sub>2</sub>	1.72		1
NO <sub>x</sub>	8.1	2.5	1
VOC	3.9	4.0	1
CO	11.8	6.0	1

- <sup>1</sup> Demonstration of compliance required for the filterable portion (6.0 lb/hr) only. The Permittee will have one year after EPA promulgates a new reference method for the condensable portion to demonstrate compliance of the permit limit.

#### 2. Hazardous Air Pollutants: Turbine Operating on Natural Gas – Steady State

Pollutant	lb/hr	ppmvd @ 15% O <sub>2</sub>	Basis
Acrolein	5.53E-03		2
Ammonia	5.98	5.0	1
Formaldehyde	6.29E-01		2

### B. Steady State ULSK

#### 1. Criteria Pollutants Emission Rates

Pollutant	lb/hr	ppmvd @ 15% O <sub>2</sub>	Basis
PM <sub>10</sub> / PM <sub>2.5</sub> (total) <sup>1</sup>	29.7		1
SO <sub>2</sub>	1.2		1
NO <sub>x</sub>	19.5	5.9	1
VOC	4.8	5.0	1
CO	12.1	6.0	1
Pb	1.11E-02		2

- <sup>1</sup> Demonstration of compliance required for the filterable portion (28.0 lb/hr) only. The Permittee will have one year after EPA promulgates a new reference method for the condensable portion to demonstrate compliance of the permit limit.

2. Hazardous Air Pollutants Emission Rates

Pollutant	lb/hr	ppmvd @ 15% O <sub>2</sub>	Basis
1,3 Butadiene	1.27E-02		2
Ammonia	6.11	5.0	1
Arsenic	2.05E-04		3
Benzene	4.36E-02		2
Beryllium	2.05E-04		3
Cadmium	3.80E-03		2
Chromium	8.71E-03		2
Formaldehyde	2.22E-01		2
Lead	1.11E-02		2
Manganese	2.05E-04		3
Mercury	9.50E-04		2
Naphthalene	2.77E-02		2
Nickel	3.64E-03		2
PAH	4.01E-03		2
Selenium	1.98E-02		2
Sulfuric Acid	1.25		1

**C. Startup and Shutdown Emission Limits**

**Startup:** It is the period of time from initiation of combustion firing until the combustion turbine reaches steady state operation and until the control equipment attains its normal operating temperature and steady state operation.

**Shutdown:** It is the period of time from the initiation of the shutdown process of the combustion turbine until the point at which the combustion process has stopped.

1. Natural Gas Startup and Shutdown Events

	Type of Startup or Shutdown Event		
	Cold Startup	Shutdown	Basis
Maximum Duration of Startup or Shutdown Event (hr)	1	1	
NO <sub>x</sub> <sup>1</sup> (lb/hr)	18.1	23.1	1
CO <sup>1</sup> (lb/hr)	61.3	76.8	1

2. ULSK Startup and Shutdown Events

	Type of Startup or Shutdown Event		
	Cold Startup	Shutdown	Basis
Maximum Duration of Startup or Shutdown Event (hr)	1	1	
NO <sub>x</sub> <sup>1</sup> (lb/hr)	40.0	58.5	1
CO <sup>1</sup> (lb/hr)	67.3	69.2	1

- <sup>1</sup> The values presented are deemed to be representative, by the manufacturer, of uncontrolled emissions during startup and shutdown events from this turbine. These tables will be updated and amended in accordance with Part VII.D of this permit.

**D. Annual Emission Limits**

1. Criteria Pollutants

Criteria Pollutant	TPY**
PM <sub>10</sub> / PM <sub>2.5</sub> (total) <sup>1</sup>	44.3
SO <sub>2</sub>	7.5
NO <sub>x</sub>	39.5
VOC	17.6
CO	51.9
Pb	3.99E-03

- <sup>1</sup> Demonstration of compliance required for the filterable portion (34 TPY) only. The Permittee will have one year after EPA promulgates a new Reference Method for the condensable portion to demonstrate compliance of the permit limit.

2. Hazardous Air Pollutants

Pollutant	TPY**
Ammonia	26.3
Sulfuric Acid	4.68

- \*\* Emission limits are combined worst case for each pollutant for this unit, using either natural gas for a maximum of 8,760 hours/year or ULSK for a maximum of 720 hours/year at maximum rated capacity or a combination thereof.

Emission limits in Part III of this permit were calculated using emission factors from the following sources:

- Manufacturer’s Data
- AP-42, 5<sup>th</sup> Edition, Tables 3.1.3, 3.1-4 and 3.1-5, April 2000
- Fuel Analysis

**E. Hazardous Air Pollutants**

This equipment shall not cause an exceedance of the Maximum Allowable Stack Concentration (MASC) for any hazardous air pollutant (HAP) emitted and listed in RCSA Section 22a-174-29. [STATE ONLY REQUIREMENT]

**F. Opacity**

This equipment shall not exceed 10% opacity during any six minute block average as measured by 40 CFR 60, Appendix A, Reference Method 9.



- H. The commissioner may require other means (e.g. stack testing) to demonstrate compliance with the above emission limits, as allowed by state or federal statute, law or regulation.

## **PART VI. STACK EMISSION TEST REQUIREMENTS**

- A. Stack emission testing shall be performed in accordance with the Emission Test Guidelines available on the DEEP website at [www.ct.gov/deep/stacktesting](http://www.ct.gov/deep/stacktesting).
- B. Stack testing shall be required for the following pollutants:
- PM<sub>10</sub>/PM<sub>2.5</sub>       NO<sub>x</sub>       CO       VOC
- Hazardous Air Pollutants in Part III of this permit
- C. Stack testing shall be conducted for the following operating modes:
1. Turbine only on ULSK; and
  2. Turbine only on natural gas
- D. Recurrent stack testing shall be performed at least once every five years from the date of the previous stack test to demonstrate compliance with their respective limits.
- E. Recurrent stack testing is not required for pollutants requiring CEMs (NO<sub>x</sub>, CO and NH<sub>3</sub>).
- F. Fuel analysis of the metals in the ULSK may be substituted for stack testing for metallic HAPs while firing ULSK. If fuel analysis indicates a potential MASC violation, the Permittee shall conduct stack test for the HAPs in question within 30 days from receiving the fuel analysis.
- G. The Permittee shall perform recurrent stack emission testing for ammonia when firing natural gas and ULSK.
- H. The Permittee shall perform recurrent stack emission testing for lead and sulfuric acid when firing ULSK only.
- I. Stack test results shall be reported as follows:
1. all pollutants in units of lb/hr,
  2. VOC in units of ppmvd at 15% O<sub>2</sub>.

## **PART VII. SPECIAL REQUIREMENTS**

- A. The Permittee shall operate and maintain this equipment in accordance with the manufacturer's specifications and written recommendations. The Permittee shall operate and maintain this stationary combustion turbine, air pollution control equipment and monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times including during startup, shutdown and malfunction.
- B. The Permittee shall immediately institute shutdown of the turbine in the event a malfunction cannot be corrected within three hours.

- C.** The Permittee shall operate this facility at all times in a manner so as not to violate or contribute significantly to the violation of any applicable state noise control regulations, as set forth in RCSA §§22a-69-1 through 22a-69-7.4. (STATE ONLY REQUIREMENT)
- D.** The Permittee shall track and record emissions of NO<sub>x</sub> and CO for all start-up and shut-down events for this turbine during the first 18 months of commercial operation. Within 60 days of the end of 18 months of commercial operation of the turbine, the Permittee shall submit a report of emissions during start-up and shut down events. If the determined start-up and shutdown emission rates are higher than the limits in Part V.B of this permit, then the Permittee shall submit an application for a permit modification to incorporate these emission rates into Part V.B of this permit. Subsequent emissions for start-up and shut-down events will be subject to said table.
- E.** The Permittee shall monitor and record ammonia slip emissions, from this source during the first 36 months of commercial operation. Records shall also include catalyst degradation over time and lifecycle, ammonia emissions over time, costs for catalysts and equipment, and emerging SCR technology. This data shall be recorded and maintained on the premises and is in addition to any monitoring required under Part III of this permit. The following requirements apply:
1. No later than 60 days from the last day of each calendar year of commercial operation of this source the Permittee shall submit a summary of operating data collected during the previous year, to the commissioner. This summary report is not required to be submitted for the last year of the ammonia slip monitoring required under Part VII.E of this permit.
  2. No later than 120 days from the last day of the third calendar year of commercial operation of this source the Permittee shall submit a final report summarizing the results of the ammonia slip monitoring required under Part VII.E of this permit, including conclusions regarding ammonia slip emissions to the commissioner.
  3. If there is a lack of data at the end of 36 months to make a good engineering determination regarding ammonia slip emissions, the ammonia slip monitoring under Part VII.E of this permit shall be extended an additional 24 months and the final report shall be submitted no later than 120 days from the last day of the fifth calendar year of commercial operation of this source.
- F.** The Permittee shall comply with all applicable sections of the following New Source Performance Standard(s) at all times.
- Title 40 CFR Part 60, Subpart: KKKK and A
- Copies of the Code of Federal Regulations (CFR) are available online at the U.S. Government Printing Office website.
- G.** The Permittee shall comply with all applicable requirements of the Federal Acid Rain Program codified in Title 40 CFR Parts 72-78, inclusive, by the deadlines set forth within the aforementioned regulation.
- H.** The Permittee shall notify the commissioner, in writing, of the commencement of construction, completion of construction and commencement of commercial operation of this source. Such written notifications shall be submitted no later than 30 days after the subject event.

## **PART VIII. ADDITIONAL TERMS AND CONDITIONS**

- A.** This permit does not relieve the Permittee of the responsibility to conduct, maintain and operate the regulated activity in compliance with all applicable requirements of any federal, municipal or other state agency. Nothing in this permit shall relieve the Permittee of other obligations under applicable federal, state and local law.
- B.** Any representative of the DEEP may enter the Permittee's site in accordance with constitutional limitations at all reasonable times without prior notice, for the purposes of inspecting, monitoring and enforcing the terms and conditions of this permit and applicable state law.
- C.** This permit may be revoked, suspended, modified or transferred in accordance with applicable law.
- D.** This permit is subject to and in no way derogates from any present or future property rights or other rights or powers of the State of Connecticut and conveys no property rights in real estate or material, nor any exclusive privileges, and is further subject to any and all public and private rights and to any federal, state or local laws or regulations pertinent to the facility or regulated activity affected thereby. This permit shall neither create nor affect any rights of persons or municipalities who are not parties to this permit.
- E.** Any document, including any notice, which is required to be submitted to the commissioner under this permit shall be signed by a duly authorized representative of the Permittee and by the person who is responsible for actually preparing such document, each of whom shall certify in writing as follows: "I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement made in the submitted information may be punishable as a criminal offense under section 22a-175 of the Connecticut General Statutes, under section 53a-157b of the Connecticut General Statutes, and in accordance with any applicable statute."
- F.** Nothing in this permit shall affect the commissioner's authority to institute any proceeding or take any other action to prevent or abate violations of law, prevent or abate pollution, recover costs and natural resource damages, and to impose penalties for violations of law, including but not limited to violations of this or any other permit issued to the Permittee by the commissioner.
- G.** Within 15 days of the date the Permittee becomes aware of a change in any information submitted to the commissioner under this permit, or that any such information was inaccurate or misleading or that any relevant information was omitted, the Permittee shall submit the correct or omitted information to the commissioner.
- H.** The date of submission to the commissioner of any document required by this permit shall be the date such document is received by the commissioner. The date of any notice by the commissioner under this permit, including but not limited to notice of approval or disapproval of any document or other action, shall be the date such notice is personally delivered or the date three days after it is mailed by the commissioner, whichever is earlier. Except as otherwise specified in this permit, the word "day" means calendar day. Any document or action which is required by this permit to be submitted or performed by a date which falls on a Saturday, Sunday or legal holiday shall be submitted or performed by the next business day thereafter.

- I. Any document required to be submitted to the commissioner under this permit shall, unless otherwise specified in writing by the commissioner, be directed to: Office of Director; Enforcement Division; Bureau of Air Management; Department of Energy and Environmental Protection; 79 Elm Street, 5th Floor; Hartford, Connecticut 06106-5127.