



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).

Owner/Operator	Algonquin Gas Transmission, LLC
Address	P.O. Box 1642, Houston, TX 77251
Equipment Location	40 Woodruff Hill Road, Oxford, CT 06478
Equipment Description	Solar Mars 100-15000 Turbine/Natural Gas Compressor
Collateral Conditions	This permit contains limitations on Greenhouse Gas (CO ₂ e) emissions for all CO ₂ e emitting sources on the premises.
Town-Permit Numbers	144-0020
Premises Number	18
Stack Number	2
Modification Issue Date	September 4, 2018
Prior Permit Issue Dates	May 12, 2017 June 11, 2015 December 27, 2006
Expiration Date	None

/s/ Robert E. Kaliszewski
Robert E. Kaliszewski
Deputy Commissioner

9/4/2018
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

Algonquin Gas Transmission, LLC operates the Solar Mars 100-15000 Turbine/Natural Gas Compressor together with another Solar Mars Turbine (Permit No. 144-0019) and two Solar Taurus Turbines (Permit Nos. 144-0021 and 144-0029) at their Oxford Compressor Station.

B. Equipment Design Specifications

1. Fuel Type: Natural Gas
2. Maximum Fuel Firing Rate (scf/hr): 141,093
3. Maximum Gross Heat Input (MMBtu/hr): 143.92

C. Control Equipment Design Specifications

1. SoLoNO_x
 - a. Make and Model: Solar
 - b. Pollutants Controlled: NO_x

D. Stack Parameters

1. Minimum Stack Height (ft): 43.6
2. Minimum Exhaust Gas Flow Rate at Maximum Load (acfm): 175,712
3. Minimum Stack Exit Temperature at Maximum Load (°F): 845
4. Minimum Distance from Stack to Nearest Property Line (ft): 420

PART II. DEFINITIONS

- A. "Low temperature event" shall be defined as operation of the turbine when the inlet air temperature is below 0 °F.
- B. "Shutdown event" shall be defined as the initial lowering of turbine fuel combustion rate beginning once SoLoNO_x is inactive and ending at the point which the fuel combustion process has stopped.
- C. "Startup event" shall be defined as the period of time from initiation of fuel combustion until SoLoNO_x is active.
- D. "Steady-state" operation shall be defined as operation of the turbine when SoLoNO_x is active.

- E. “Transient event” shall be defined as any infrequent or unplanned operation of the turbine outside of manufacturer warranty conditions with SoLoNOx inactive, not including startup/shutdown or low temperature events.

PART III. OPERATIONAL CONDITIONS

A. Equipment

- 1. Allowable Fuel
 - a. Fuel Type: Natural Gas
 - b. Maximum Natural Gas Consumption over any Consecutive 12 Month Period (MMscf): 1,090.892
 - c. Maximum Sulfur Content: 5 grains/100 scf
- 2. Startup and Shutdown Events
 - a. The duration of a startup event shall not exceed 18 minutes.
 - b. The duration of a shutdown event shall not exceed 17 minutes.

B. Control Equipment

- 1. The Permittee shall not operate the turbine without the SoLoNOx control device, except as allowed during startup/shutdown, transient events, and low temperature events.

C. The Permittee shall operate and maintain the 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, malfunctions and transient events.

D. The Permittee shall operate and maintain the turbine, air pollution control equipment and monitoring equipment in accordance with manufacturer’s specifications and written recommendations.

PART IV. ALLOWABLE EMISSION LIMITS

The Permittee shall not cause or allow this equipment to exceed the emission limits stated herein at any time.

A. Allowable Short Term Emission Limits at Steady State

- 1. Turbine Inlet Air Temperature above 0 °F

Pollutant	lb/hr	ppmvd @ 15% O ₂
PM/PM ₁₀ /PM _{2.5}	0.92	
SO ₂	1.96	
NO _x	7.56	15
CO	7.67	25
VOC	0.96	

2. Turbine Inlet Air Temperatures Between 0 °F and -20 °F

Pollutant	lb/hr
PM/PM ₁₀ / PM _{2.5}	0.95
SO ₂	2.02
NO _x	21.8
CO	31.6
VOC	1.98

3. Turbine Inlet Air Temperatures Below -20 °F

Pollutant	lb/hr
PM/PM ₁₀ / PM _{2.5}	0.95
SO ₂	2.02
NO _x	62.3
CO	47.4
VOC	2.97

B. Allowable Short Term Emissions During Transient Events

Pollutant	lb/minute
NO _x	1.04
CO	0.79
VOC	0.05

C. Allowable Short Term Emissions During Startup and Shutdown Events (at all temperatures)

Pollutant	Startup Emissions (lb/event)	Shutdown Emissions (lb/event)
NO _x	1.48	1.71
CO	143.4	156.4
VOC	5.18	5.11

D. Annual Emission Limits

Criteria Pollutants	Tons per 12 Consecutive Months
PM/PM ₁₀ /PM _{2.5}	3.67
SO ₂	7.79
NO _x	30.3
CO	48.3
VOC	5.32
CO ₂ e	65,906
CO ₂ e ⁽¹⁾	199,998

⁽¹⁾ Note: Combined premises emissions limit, including fugitive emissions sources.

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 RCSCA 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.

- G.** Demonstration of compliance with the above emission limits shall be met by calculating the emission rates using the most recent approved stack test results for that pollutant, or if unavailable, emission factors from the following sources:

1. Turbine Inlet Air Temperatures above 0 °F

Criteria Pollutant	Source
PM/PM ₁₀ /PM _{2.5}	AP-42, Section 3.1, Table 3.1-2a (April 2000)
NO _x , CO, and VOC	Vendor Guaranteed Emission Rate
SO ₂	0.94 x S lb/MMBtu Where S: percent sulfur in fuel - AP-42, Section 3.1, Table 3.1-2a (April 2000) using Tariff (5 gr/100scf)
CO _{2e}	40 CFR Part 98 Subpart C – Tables C-1 and C-2 *Note: For all Inlet Air Temperatures

2. Turbine Inlet Air Temperatures Between 0 °F and -20 °F

Criteria Pollutant	Source
PM/PM ₁₀ /PM _{2.5}	Emission factors were calculated using Solar information and best engineering judgment.
NO _x	
CO	
VOC	
SO ₂	

3. Turbine Inlet Air Temperatures Below -20 °F

Criteria Pollutant	Source
PM/PM ₁₀ /PM _{2.5}	Emission factors were calculated using Solar information and best engineering judgment.
NO _x	
CO	
VOC	
SO ₂	

4. Startup/Shutdown (at all temperatures)

Criteria Pollutant	Source ⁽²⁾
NO _x	The startup/shutdown emission factors were calculated based on, not directly from, information provided by Solar and best engineering judgment.
CO	
VOC	

⁽²⁾ Product Information Letter 170 (PIL170) – Revision 8 (February 21, 2018)

5. Transient Events

Criteria Pollutant	Source ⁽³⁾
NOx	The transient event emission factors were calculated based on, not directly from, information provided by Solar and best engineering judgment.
CO	
VOC	

⁽³⁾ Product Information Letter 167 (PIL167) – Revision 6 (December 1, 2016) for full load operation at ambient temperature less than or equal to -20 °F

- 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 V. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS

A. Monitoring

1. The Permittee shall use a gas metering device to continuously monitor fuel feed to the turbine.
2. The Permittee shall monitor all startup/shutdown, malfunction, and transient events.
3. Permittee shall monitor the status of the SoLoNOx operation at all times.
4. The Permittee shall continuously monitor the inlet air temperature.
5. The Permittee shall perform inspections of the equipment as recommended by the manufacturer.

B. Record Keeping

1. The Permittee shall keep records of monthly and consecutive 12 month fuel consumption in units of standard cubic feet. The consecutive 12 month fuel consumption shall be determined by adding 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, PM₁₀, PM_{2.5}, SO₂, NO_x, 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.
3. The Permittee shall calculate and record the monthly and consecutive 12 month CO_{2e} emissions from the facility using the following methodologies:
 - a. CO₂ emissions from combustion sources shall be determined using the default emission factors found in 40 CFR Part 98 Subpart C – Table C-1.
 - b. Methane (CH₄) and nitrous oxide (N₂O) from combustion sources shall be determined using the default emission factors found in 40 CFR Part 98 Subpart C, Table C-2.
 - c. Estimated fugitive emissions of CH₄ from piping components shall be determined using the default emission factors found in 40 CFR Part 98 Subpart W, Tables W-3A and W-3B, as appropriate.
 - d. Estimated fugitive emissions of CH₄ from gas releases shall be determined using the default emission factors found in 40 CFR Part 98 Subpart W, as appropriate.

4. The Permittee shall make and keep records of the Allowable Stack Concentration (ASC) and MASC calculations for the turbine to show compliance with RCSA §22a-174-29.
5. The Permittee shall keep on site a record of the vendor guaranteed emission rates for NO_x, CO and VOC at inlet air temperature greater than 0°F.
6. The Permittee shall make and keep records of turbine inlet air temperature on a no less frequent basis than hourly while the turbine is operating during the months in which low ambient temperatures are within the realm of reasonability (October, November, December, January, February and March). The Permittee may utilize ambient temperature monitoring data recorded at the nearest observing station which collects National Weather Service (NWS) data for data substitution purposes should the monitoring and recording system which is integral to the turbine malfunction.
7. The Permittee shall make and keep records of the date and hours of operation when the turbine inlet air temperature is equal to or below 0 °F and greater than -20 °F. Such records shall contain the following information:
 - a. date and time of the event;
 - b. duration of the event, and
 - c. total emissions emitted (lb) during the event.

These Emissions shall be counted towards the annual emissions limits in Part IV.D of this permit.

8. The Permittee shall make and keep records of the date and hours of operation when the turbine inlet air temperature is below -20 °F. Such records shall contain the following information:
 - a. date and time of the event;
 - b. duration of the event, and
 - c. total emissions emitted (lb) during the event.

These Emissions shall be counted towards the annual emissions limits in Part IV.D of this permit.

9. The Permittee shall make and keep records of the occurrence and duration of any startup, shutdown, or malfunction event in the operation of the turbine; or any malfunction of the air pollution control equipment [40 CFR §60.7(b)]. Such records shall contain the following information:
 - a. type of event (startup, shutdown, or malfunction);
 - b. equipment affected;
 - c. date of event;
 - d. duration of event (minutes); and
 - e. total emissions emitted (lb) during the event.

These Emissions shall be counted towards the annual emissions limits in Part IV.D of this permit.

10. The Permittee shall make and keep records indicating the instances when the SoLoNO_x is disabled while the turbine is in operation, not including startup/shutdown or low temperature events. Such records shall include:
 - a. the date and time the SoLoNO_x is disabled;
 - b. the duration the SoLoNO_x is disabled; and
 - c. the reason and corrective action taken.

11. The Permittee shall make and keep records of all transient events. Such records shall include, but not be limited to the following:
 - a. date and time of the event;
 - b. duration of the event, and
 - c. identification of transient event, if such event caused a shutdown of the turbine.

These Emissions shall be counted towards the annual emissions limits in Part IV.D of this permit.

12. The Permittee shall calculate and record NO_x, CO and VOC emissions during transient events using emission rates supplied by the manufacturer. These emissions shall be counted towards the annual emissions limits in Part IV.D of this permit.
13. The Permittee shall make and keep records of a current valid purchase contract, tariff sheet, or transportation contract which demonstrates the maximum total sulfur content of the natural gas burned in the turbine.
14. The Permittee shall make and keep records of all exceedances of any operating parameter. Such records shall include:
 - a. the date and time of the exceedance;
 - b. a detailed description of the exceedance;
 - c. the duration of the exceedance; and
 - d. reason and corrective action taken.
15. The Permittee shall maintain records of the maintenance/repairs/parts replacement of the turbine. The maintenance records shall include, at a minimum, a description of the maintenance activity, the date the maintenance was performed, and cost of service.
16. The Permittee shall make and keep records of manufacturer's information for the turbine and SoLoNO_x.
17. The Permittee shall keep records of stack testing results.
18. The Permittee shall keep copies of all reports and notifications submitted in accordance with Part V.C of this permit.
19. The Permittee shall make and keep records of any applicable requirement as required by 40 CFR Part 60 Subpart KKKK.
20. The Permittee shall make and 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 all reports as required pursuant to 40 CFR §60.4375.
2. The Permittee shall notify the commissioner in writing of any malfunction of the turbine, the air pollution control equipment, or the continuous monitoring system. The Permittee shall submit such notification within ten days of the malfunction. The notification shall include the following:
 - a. a description of the malfunction and a description of the circumstances surrounding the cause or likely cause of such malfunction; and

- b. a description of all corrective actions and preventive measures taken and/or planned with respect to such malfunction and the dates of such actions and measures.
- 3. The Permittee shall notify the commissioner in writing of any exceedance or deviation of an emissions limitation or operating parameter, and shall identify the cause or likely cause of such exceedances or deviations, all corrective actions and preventive measures taken with respect thereto, and the dates of such actions and measures as follows:
 - a. For any hazardous air pollutant, no later than 24 hours after such exceedance commenced; and
 - b. For any other regulated air pollutant or operating parameter, no later than ten days after such exceedance commenced.
- 4. The Permittee shall submit the above notifications to the Supervisor of the Compliance Analysis & Coordination Unit, Enforcement Section, Bureau of Air Management; Department of Energy and Environmental Protection; 79 Elm Street, 5th Floor; Hartford, Connecticut 06106-5127.

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.
- B. Annual/biennial stack testing to show compliance with 40 CFR Part 60 Subpart KKKK shall be performed in accordance with 40 CFR §60.4400.
- C. Stack testing for NOx and CO emissions shall be performed to demonstrate compliance with the emission limits found in Part IV.A. of this permit.
 - 1. Each recurrent stack test for NOx and CO shall be performed within 63 months from the date of the previous stack test conducted under Part VI.C. of this permit.
- D. Stack test results shall be reported as follows, as applicable:
 - 1. All Pollutants in units of lb/hr;
 - 2. NOx and CO in units of ppmvd at 15% O₂.
- E. During stack emission testing, the manufacturer’s performance data curve may be used to determine the Maximum Gross Heat Input, which may vary +/- 5%, at inlet air temperature between 0 and 100°F using Equation 1 below:

Equation 1: $Y = -0.0009X^2 - 0.2141X + 135.7$

Where: Y = Maximum Gross Heat Input (MMBtu/hr)
 X = Inlet Air Temperature (°F)⁽⁴⁾

Inlet Air Temperature (X) °F	Maximum Gross Heat Input (Y) MMBtu/hr
0	135.7
20	131.1
40	125.7
60	119.6
80	112.8
100	105.3

(4) Note: In accordance with Part V.B.6 of this permit, ambient temperature monitoring data recorded at the nearest observation station which collects National Weather Service (NWS) data may be used for data substitution purposes should the inlet air monitoring system malfunction.

F. The commissioner retains the right to require stack testing for any pollutant at any time to demonstrate compliance.

PART VII. SPECIAL REQUIREMENTS

A. The Permittee shall comply with all applicable sections of the following New Source Performance Standard(s) at all times.

Title 40 CFR Part 60, Subparts KKKK and A

Copies of the Code of Federal Regulations (CFR) are available online at the U.S. Government Printing Office website.

B. The Permittee shall not cause or permit the emission of any substance or combination of substances which creates or contributes to an odor beyond the property boundary of the premises that constitutes a nuisance as set forth in RCSA Section 22a-174-23.[STATE ONLY REQUIREMENT]

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 Sections 22a-69-1 through 22a-69-7.4.[STATE ONLY REQUIREMENT]

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 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; Engineering & Enforcement Division; Bureau of Air Management; Department of Energy and Environmental Protection; 79 Elm Street, 5th Floor; Hartford, Connecticut 06106-5127.