

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>	Algonquin Gas Transmission, LLC
<b>Address</b>	P.O. Box 1642, Houston, TX 77251
<b>Equipment Location</b>	Cromwell Compressor Station 252 Shunpike Road, Cromwell, CT 06416
<b>Equipment Description</b>	Solar Centaur 40-T4702S Natural Gas Turbine
<b>Town-Permit Numbers</b>	043-0005
<b>Premises Number</b>	5
<b>Stack Number</b>	7
<b>Modification Issue Date</b>	June 1, 2015
<b>Prior Permit Issue Date</b>	June 25, 1985 (Original Operating Permit) August 16, 1995 (Modification) May 10, 2004 (Modification)
<b>Expiration Date</b>	None

/s/Anne Gobin  
Robert J. Klee  
Commissioner

June 1, 2015  
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 (Algonquin) transports natural gas via underground pipelines from New Jersey through southern New England to eastern Massachusetts or in reverse. At several points along the pipeline, the gas must be recompressed to ensure that it continues to move along the pipeline and can be delivered to customers at serviceable pressures. The gas is compressed by gas-fired turbine driven centrifugal compressors and gas-fired reciprocating internal combustion engine compressors. The natural gas used to fuel the gas-fired units comes from Algonquin's pipeline.

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

1. Turbine
  - a. Maximum Fuel Firing Rate (scfh):
    - 50,512 at 0 °F
    - 46,868 at 50 °F
  - b. Maximum Gross Heat Input (MMBtu/hr):
    - 51.52 at 0 °F
    - 47.81 at 50 °F

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

Low NO<sub>x</sub> burner

### **D. Stack Parameters**

1. Minimum Stack Height (ft): 59.0
2. Minimum Exhaust Gas Flow Rate at 100% load (acfm): 73,112
3. Stack Exit Temperature (°F): 873
4. Minimum Distance from Stack to Property Line (ft): 480

## **PART II. OPERATIONAL CONDITIONS**

### **A. Equipment**

1. Turbine
  - a. Fuel Type(s): Natural Gas
  - b. Maximum Fuel Consumption over any Consecutive 12 Month Period (MMscf): 411
  - c. Maximum Natural Gas Sulfur Content: 20.0 grains/100scf [40 CFR §60.331(u)]

### PART III. ALLOWABLE EMISSION LIMITS

The Permittee shall not cause or allow this equipment to 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.

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. Short Term Emission Limits

These short term emission limits do not apply during periods of startup and shutdown, unless otherwise noted.

##### 1. Turbine Inlet Temperatures above 0 °F

Pollutant	lb/hr	lb/MMBtu	ppmvd @ 15% O <sub>2</sub>
PM <sub>10</sub>	0.33		
SO <sub>x</sub>	0.18		
NO <sub>x</sub>	7.78	0.15	42.0
VOC	0.32		
CO	5.64		

#### B. Startup and Shutdown Emission Limits (at all temperatures)

Pollutant	Startup Emissions <sup>(1)&amp;(2)</sup> (lb/event)	Shutdown Emissions <sup>(1)&amp;(2)</sup> (lb/event)
NO <sub>x</sub>	0.78	0.37
CO	76.7	33.6

(1) The startup/shutdown values were calculated using Solar information and adjusted to account for site specific temperature, flowrate and startup/shutdown information.

(2) The Permittee shall minimize emissions during periods of startup and shutdown by the following work practices and time constraints:

- lb/event means "one startup" or "one shutdown;"
- The duration of startup shall not exceed 10 minutes for a hot, warm or cold startup;
- The duration of shutdown shall not exceed 10 minutes; and
- Emissions during these periods shall be counted towards the annual emission limits stated herein.

#### C. Annual Emission Limits

Pollutant	tons per 12 consecutive months
PM <sub>10</sub>	1.40
SO <sub>x</sub>	0.8
NO <sub>x</sub>	31.7
VOC	1.5
CO	22.9

### PART III. ALLOWABLE EMISSION LIMITS, continued

#### D. 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]

#### E. 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.

#### F. 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	Emission Factor (lb/MMSCF)	Source
PM <sub>10</sub>	6.73	AP42 Table 3.1-1, dated 4/00
SO <sub>x</sub>	3.47	AP42 Table 3.1-1, dated 4/00
NO <sub>x</sub>	154.07	Manufacturer's data
VOC	6.27	AP42 Table 3.1-1, dated 4/00, adjusted with manufacturer's data
CO	111.66	Manufacturer's data

##### 2. Startup/Shutdown

Criteria Pollutant	Startup Emission Factor	Shutdown Emission Factor	Source
NO <sub>x</sub>	0.79 lb/event	0.37 lb/event	The startup/shutdown emission factors were calculated using Solar information and best engineering judgment.
CO	76.7 lb/event	33.6 lb/event	

##### 3. 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 IV. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS

#### A. Monitoring

The Permittee shall use gas metering devices to continuously monitor fuel feed to the turbine to show compliance with the limit in Part II of this permit.

#### 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<sub>10</sub>, SO<sub>x</sub>, NO<sub>x</sub>, VOC and CO emissions, including startup and shutdown, 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.

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

The Permittee shall make these calculations within 30 days of the end of the previous month.

3. The Permittee shall make and keep records of the Allowable Stack Concentration (ASC) and MASC calculations for the turbine to show compliance with RCSA Section 22a-174-29.
4. The Permittee shall 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 combustion turbine.
5. The Permittee shall keep records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of the stationary gas 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);
  - e. fuel being used during event; and
  - f. total NO<sub>x</sub> and CO emissions emitted (lb) during the event.
6. The Permittee shall keep records of stack testing results.
7. The Permittee shall keep records of manufacturer's information for the low NO<sub>x</sub> burner.
8. 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 annual emission inventory statements as requested by the commissioner.
2. The Permittee shall notify the commissioner in writing of a deviation from an emission limit (short-term and/or long term) or operational parameter, used as a surrogate, 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.

The notification shall include the following:

- a. a description of the circumstances surrounding the cause or likely cause of such deviation; and
- b. a description of all corrective actions and preventive measures taken and/or planned with respect to such deviation and the dates of such actions and measures.
- c. the quantity of excess emissions occurring during the event.
- d. the duration of the event.

## PART V. STACK EMISSION TEST REQUIREMENTS

- A. Stack emission testing shall be performed in accordance with the [Emission Test Guidelines](#) available on the DEEP website.

Stack testing shall be required for the following pollutant:  NO<sub>x</sub>

- B. Recurrent stack testing for NO<sub>x</sub> shall be performed within five years from the previous stack test to demonstrate compliance with the limits in Part III of this permit.
- C. The maximum rated capacity of the turbine may be corrected for the ambient temperature at the time of stack testing using Equation 1 below.

*Note: The equation is applicable at temperatures between 0 °F and 100 °F*

Equation 1:

$$Y: -0.0007X^2 - 0.0494X + 46.777$$

Where Y= Heat Input (MMBtu/hr)  
X= Ambient Air Temperature (°F)

- D. Stack test results shall be reported in units of lb/hr, ppmvd at 15% O<sub>2</sub> and lb/MMBtu.
- E. The commissioner retains the right to require stack testing of any pollutant at any time to demonstrate compliance.

## PART VI. OPERATION AND MAINTENANCE REQUIREMENTS

- A. The Permittee shall operate and maintain this equipment in accordance with the manufacturer's specifications and written recommendations.
- B. The Permittee shall operate and maintain this equipment and air pollution control equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times including during startup, shutdown, and malfunction.
- C. The Permittee shall properly operate the control equipment at all times that this equipment is in operation and emitting air pollutants.

## 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, Subpart: GG

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

- B. 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 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.

**PART VIII. ADDITIONAL TERMS AND CONDITIONS, continued**

- 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.

# Attachment A

## MEMORANDUM

August 7, 1995

TO: Christopher A. James, Assistant Director    EPE #: 18913  
Steven E. Peplau, Director                      Date Rec'd: July 6, 1995  
Carmin DiBattista, Bureau Chief

FROM: Lisa A. Childress, APCE I  
Richard A. Pirolli, SAPCE

SUBJECT: ALGONQUIN GAS TRANSMISSION COMPANY'S REQUEST TO  
OBTAIN A FINAL REVISED PERMIT TO OPERATE UNIT C-7  
SOLAR CENTAUR T-4700 NATURAL GAS TURBINE ENGINE AT  
THE CROMWELL, CT FACILITY

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### DISCUSSION:

Algonquin Gas Transmission Company has applied for a final revised permit to operate the unit C-7 turbine engine at the Cromwell facility. The turbine had been issued (August 19, 1994) a temporary permit to operate so that stack emission testing for NO<sub>x</sub> and CO could be conducted. This stack emission testing was conducted on July 28, 1995 and the test report was submitted on August 1, 1995.

The average heat input and hourly fuel firing rate for the turbine during the testing was 43 MMBTU/hr and 41,807 ft<sup>3</sup>/hr, respectively. However, the permit (#043-0005) lists the maximum heat input and hourly fuel firing rate for the turbine as being 46.1 MMBTU/hr and 49,817 ft<sup>3</sup>/hr, respectively. These limits represent the worst case operating conditions. The heat input and hourly fuel firing rate are dependant upon the ambient temperature (i. e., as ambient temperature increases the heat input and hourly fuel firing rate decrease). Thus, the worst case operating conditions occur at 100% load and 0°F.

Since the testing was conducted at an ambient temperature higher than 0°F, vendor data has been interpolated to determine whether the turbine was operating at 90% of maximum rated capacity. From this data, it has been determined that at 86.3°F (average ambient temperature during testing) the turbine would have a heat input value of 37.4 MMBTU/hr and an hourly fuel firing rate of 40,335 ft<sup>3</sup>/hr. These values would then be 33.6 MMBTU/hr and 36,302 ft<sup>3</sup>/hr at 90% of maximum rated capacity. Thus, the turbine was operating at 90% of maximum rated capacity during the testing.

In addition, the vendor data has been interpolated to determine the pounds of NOx that would be emitted on an hourly basis at 86.3°F. This has been determined to be 6.16 lb(NOx)/hr. The average hourly NOx emission rate for the turbine during the testing has been determined to be 2.2. Therefore, compliance has been shown at the above-mentioned ambient temperature. NOTE: The permit value of 7.76 lb(NOx)/hr is based upon an ambient temperature of 0°F.

Also, compliance has been demonstrated for the hourly CO emission rate. The average hourly emission rate during the testing has been determined to be 0.8. The vendor data has been interpolated to determine the hourly emission at 86.3°F. This rate has been determined to be 4.47 lb/hr. The tested value does not exceed the 13.49 lb/hr permit limit for CO.

Based on the above, it is recommended that a final revised permit to operate be issued to Algonquin Gas Transmission Company.

Lisa A. Childress  
Lisa A. Childress  
APCE I

8/10/95  
Date

REVIEW:

R.A. PIROLI: Richard A. Pirolli 8/10/95

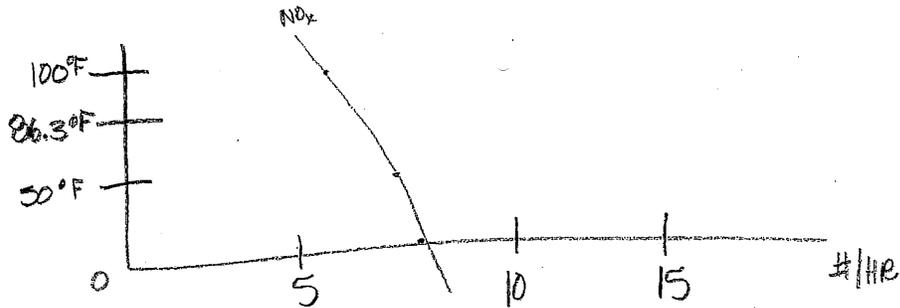
C.A. JAMES: Don Blunk

S.E. PEPLAU:

C.N. DIBATTISTA: for SEP 8/11/95  
FB 8/11/95

/jaz

		<u>NO<sub>x</sub></u>	<u>CO</u>	<u>TEST AVE</u>
100°F	100% LOAD	5.78 #/HR	4.19 #/HR	
86.3°F	100% LOAD	X	Y	2.2, 0.8
50°F	100% LOAD	7.20 #/HR	5.22 #/HR	
0°F	100% LOAD	7.76 #/HR	13.49 #/HR	



$$m = \frac{100^\circ\text{F} - 50^\circ\text{F}}{5.78 - 7.20} = -35.21126761$$

$$-35.21126761 = \frac{86.3 - 50}{x - 7.20}$$

$$x - 7.20 = \frac{86.3 - 50}{-35.21126761}$$

$$x = 6.16 \text{ #/HR [NO}_x\text{]}$$

$$m = \frac{100^\circ\text{F} - 50^\circ\text{F}}{4.19 - 5.22} = -48.54368932$$

$$-48.54368932 = \frac{86.3 - 50}{y - 5.22}$$

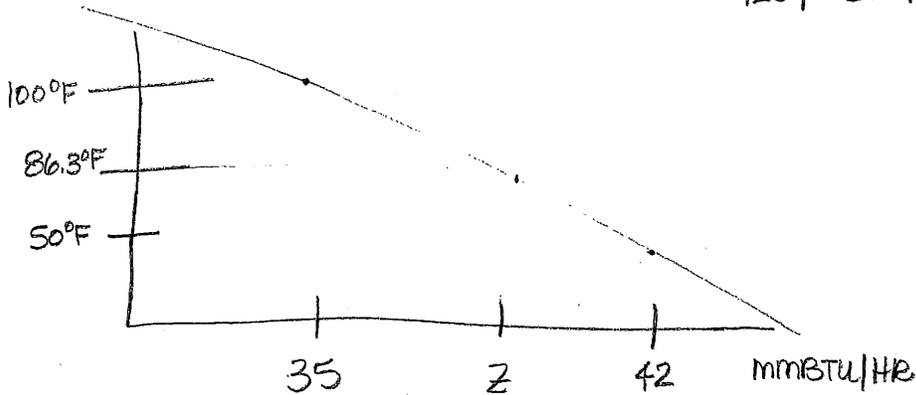
$$-5.22 = \frac{86.3 - 50}{-48.54368932}$$

$$x = 4.47$$

RUN 1 : 79°F , 42,820 FT<sup>3</sup>/HR , 44.1 mMBTU/HR  
 RUN 2 : 87°F , 41,683 FT<sup>3</sup>/HR , 42.9 mMBTU/HR  
 RUN 3 : 93°F , 40,918 FT<sup>3</sup>/HR , 42.1 mMBTU/HR  
 AVE. : 86.3°F , 41,807 FT<sup>3</sup>/HR , 43.0 mMBTU/HR

Interpolate to determine values @ AVE. AMBIENT TEMP.

100°F	100% LOAD	3524 #P	9994 BTU/#P-HR	35,218,856 BTU/HR
86.3°F	100% LOAD	X	Y	Z
50°F	100% LOAD	4669 #P	9209 BTU/#P-HR	42,996,821 BTU/HR



$$m = \frac{100^\circ\text{F} - 50^\circ\text{F}}{35,218,856 - 42,996,821} = -6.428417 \times 10^{-6}$$

$$-6.428417 \times 10^{-6} = \frac{86.3^\circ\text{F} - 50^\circ\text{F}}{Z - 42,996,821}$$

$$Z - 42,996,821 = \frac{86.3^\circ - 50^\circ}{-6.428417 \times 10^{-6}}$$

$$Z = 37,350,019 \text{ BTU/HR}$$

$$37,350,019 \text{ BTU/HR} \times \text{FT}^3 / 926 \text{ BTU} = 40,335 \text{ FT}^3/\text{HR}$$

∅ 90% have :  $(0.90)(40,335 \text{ FT}^3/\text{HR}) = 36,302 \text{ FT}^3/\text{HR}$   
 $(0.90)(37,350,019 \text{ BTU/HR}) = 33,615,017 \text{ BTU/HR}$



**REFERENCES**

- a. Public Law 101-549, Title I - Provisions for Attainment and Maintenance of National Ambient Air Quality Standards, November 15, 1990 (Clean Air Act Amendments of 1990).
- b. Letter to Connecticut DEP, Ms. Susan Amarello, Supervising Air Pollution Control Engineer, from Mr. Terrance W. Doyle, Algonquin Gas Transmission Company, June 21, 1993.
- c. Letter to Mr. Terrance W. Doyle of Algonquin Gas Transmission Company from Ms. Susan Amarello, Connecticut DEP, July 13, 1993.
- d. Regulations of the Connecticut Department of Environmental Protection Concerning Abatement of Air Pollution updated through November, 1990.
- e. United States Environmental Protection Agency, " 'Top-Down' Best Available Control Technology Guidance Document", Draft, March 15, 1990.
- f. Gas Research Institute and Electric Power Research Institute, "Environmental and Economic Evaluation of Gas Turbine SCR NO<sub>x</sub> Control (RP 2936), Gas Turbine Best Available Control Technology Guidebook", June, 1990.
- g. Nancy L. Seidman (Northeast States for Coordinated Air Use Management, Boston, MA), and Douglas L. McVay (Rhode Island Department of Environmental Management, Providence, RI), "Stationary Source Nitrogen Oxides Control Strategies in the Northeast States", Air and Waste Management Association annual meeting, June 16-21, 1991.
- h. Case involving Delmarva Power and Light Company was discussed at the "1990 Combustion Turbine NO<sub>x</sub> Control Workshop", co-sponsored by the Electric Power Research Institute and the Gas Research Institute, September 25-28, 1990.
- i. Facsimile transmission from Mr. William Perkins, Solar Turbines, Incorporated to Mr. Ronald E. Schroeder, regarding SoLoNO<sub>x</sub> units sold, shipped and operated, November 17, 1993.
- j. Telephone discussion between Mr. Roger Swingle, Manager, Environmental Programs, Solar Turbines, Incorporated, San Diego, California and Mr. Ronald E. Schroeder, P.E., oil and gas environmental consultant to Algonquin Gas Transmission Company, North Kingstown, Rhode Island, September 22, 1993.
- k. Northeast States for Coordinated Air Use Management (NESCAUM), Stationary Source Committee, "Recommendation on Emission Limits for Gas Turbines", October, 1988.
- l. Northeast States for Coordinated Air Use Management (NESCAUM), "NESCAUM BACT Guideline", October, 1988.
- m. Polymetrics, Incorporated deionized water treatment system quotation dated March 6, 1991 (cost data adjusted to 1993 dollars based on a five percent inflation rate).

- n. "Top Down" Best Available Control Technology Guidance Document, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, March 15, 1990.
- o. Control Cost Manual, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, EPA 450/3-90-006, January, 1990.
- p. Estimating Costs of Air Pollution Control, Vatavuk, William M. (senior chemical engineer with U.S. EPA's Office of Air Quality Planning and Standards), Lewis Publishers, Chelsea, Michigan, 1990.
- q. "Gas Turbine NOx Emissions Control Technologies", K.O. Smith, Chief Engineer, Advanced Development, Solar Turbines, Incorporated, San Diego, California, Turbomachinery Technology Seminar, 1989.
- r. Solar Turbines, Incorporated letter from Mr. Richard T. Westermann to Mr. Ronald E. Schroeder, regarding SoLoNOx and water injection costs, dated November 3, 1993.
- s. Letter from Mr. Alan H. Thomas, Sales Manager, W.R. Grace and Company, Grace Emission Controls Products, to Mr. Terrance Doyle of Algonquin Gas Transmission Company, regarding CO and VOC catalyst costs, dated November 2, 1993.
- t. Algonquin Gas Transmission Company memo from Mr. Patrick Convery, Plant Design, to Mr. Terrance Doyle, Environmental Affairs, regarding Cromwell Compressor Station electricity costs, dated November 19, 1993.
- u. Telephone conversation between Mr. Terrance W. Doyle, Algonquin Gas Transmission Company Environmental Affairs and Mr. Ronald E. Schroeder, regarding daily gas throughput of the proposed upgraded turbines and the company labor rate, November 17, 1993.
- v. Facsimile transmissions from Mr. Gerald Napierala, Solar Turbines, Incorporated to Mr. Ronald E. Schroeder, dated October 28 and September 30, 1993, regarding turbine performance, exhaust and emissions data.

Attachment B

MEMORANDUM

TO: Gary S. Rose, Director  
Anne R. Gobin, Acting Bureau Chief

Date Rec'd: 3/04/04  
PAMS #: 200400630 & 200400631  
EPE #: 21957 & 21958

FROM: Allan Pilver, APCE  
Richard Pirolli, SAPCE

SUBJECT: MINOR MODIFICATIONS FOR ALGONQUIN GAS TRANSMISSION  
COMPANY PERMITS 043-0005 & 043-0006 FOR GAS TURBINES AT THE CROMWELL  
COMPRESSOR STATION

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DISCUSSION: The subject applications were submitted to update emission factors for duplicate gas turbines. The emission factors were updated to reflect the current AP-42 factors and manufacturer's data. Small changes occurred in allowable annual pollutant emissions. The changes ranged from (-) 1.5 to (+) 0.6 tpy for each turbine.

The proposed changes are minor permit modifications since the increase in PTE is less than 15 TPY for any pollutant (RCSA § 22a-174-2a(e)).

The applicant is not required to publish a notice of tentative determination per RCSA § 22a-174-2a(e)(6).

The applicant's compliance history documentation includes the "Applicant Compliance History Information" form DEP-APP-002, the PAMS "Compliance History Enforcement Actions" record, and the Air Bureau E&TS Division request to, and the response from the Compliance & Field Operations Division.

It is recommended that minor permit modifications be granted to Algonquin Gas Transmission Company.

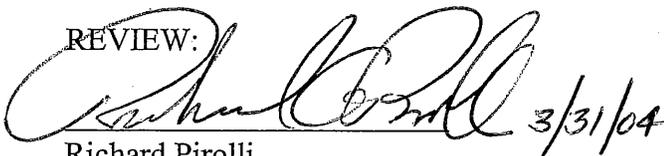


Allan B. Pilver  
APCE

3-29-04

Date

REVIEW:



Richard Pirolli  
Supervising APCE



**NSR Engineering Evaluation**  
 CT Department of Energy and Environmental Protection  
 Bureau of Air Management

<b>Company Name:</b>	Algonquin Gas Transmission, LLC	<b>Permit No.:</b>	043-0005 and 043-0006
<b>Equipment Location:</b>	252 Shunpike Road, Cromwell, CT 06416	<b>Date App Received:</b>	12/23/2014
<b>Mailing Address:</b>	P.O. Box 1642, Houston, TX 77251	<b>SIMS No.:</b>	201412064 and 65
<b>Contact Person:</b>	Mr. Reagan Mayces	<b>Date Prepared:</b>	3/4/2015
<b>Contact Title:</b>	Manager EHS US Operations	<b>Prepared By:</b>	Lidia Howard
<b>Contact Phone:</b>	(713) 627-4790	<b>Single or Multiple Units:</b>	Multiple
<b>Contact Email:</b>	RMMayces@spectraenergy.com	<b>Permit Type:</b>	Minor Mod (prepaid)
<b>Ozone:</b>	serious non-attainment	<b>Premises Size:</b>	Major
<b>PM2.5:</b>	attainment	<b>Equipment Size:</b>	Minor
<b>Equipment Description</b>	Solar Centaur 40-T4702S	<b>TV/GPLPE Permit No:</b>	043-0020-TV
Step 1: Complete all the fields above			
Step 2: <input type="button" value="Generate Eval"/>		Step 3: <input type="button" value="Update Fields"/>	

**Introduction**

**Reason for Application:** Algonquin Gas Transmission, LLC (Algonquin) submitted applications to modify Permit Nos. 043-0005 and 043-0006. Specifically, Algonquin is requesting to incorporate temperature curves into the permits.

**Regulatory Applicability:** RCSA §22a-174-2a(e)

**Discussion of Modification/Revision:** Algonquin requested to include equations and chart plotting turbine fuel flow (MMBtu/hr) versus ambient temperature in the permits. This will allow the stack testing group to stack test the turbine at 90% of its maximum rated capacity and adjust parameters in the permit as a function of ambient temperature.

The requested change does not affect emissions from the turbines or the premises.

Pursuant to RCSA §22a-174-2a(e)(6) these minor modifications will be issued without published notice, public comment, or hearing.

To gain awareness of the historical use of the performance curve by the Department I reviewed the files for Algonquin for the Chaplin and Cromwell sites (Permit Nos. 034-0001, 034-0002, 043-0005 and 043-0006). The limits in the permit represented the worst case scenario. Historically, after stack testing was conducted, the performance curves were used to ensure compliance with the following parameters (see Attachment A):

- Heat input,

- Hourly fuel firing rate,
- Operation of equipment at 90% of maximum rated capacity, and
- allowable emission limits as require by state and federal regulations.

In general, while limitation in permits were based on worst case scenario, later permits were issued with limits based on ISO conditions. Since the request to incorporate the performance curve came from the stack testing group, the performance curve will be incorporated into Permit Nos. 043-0005 and 043-0006 in the Stack Testing section of each permit, as follows:

The maximum rated capacity of the turbine may be corrected for the ambient temperature at the time of stack testing using Equation 1 below.

*Note: The equation is applicable at temperatures between 0 °F and 90 °F*

Equation 1:

$$Y: -0.0007X^2 - 0.0494X + 46.777$$

Where Y= Heat Input (MMBtu/hr)  
X= Ambient Air Temperature (°F)

Additional changes:

Chronology of Permit Nos. 043-0005 and 043-0006:

1. Final Operating permits

- Permit No. 043-0005 was issued on June 25, 1985 (PSD permit).
- Permit No. 043-0006 was issued on January 29, 1987.

2. Modifications to Permit Nos. 043-0005 and 043-0006 were issued on August 16, 1995 and August 22, 1995, respectively.

- Turbines were updated in 1995 from 3,830 hp to 4,700 hp.
- Permit No. 043-0005: Modeling was not required.
- Permit No. 043-0006: Screening was done and approved for CO and NOx on April 6, 1994.
- BACT was done for NOx, CO and VOC and determined to be low NOx combustor with a NOx emission limit of 42 ppmvd @ 15% O<sub>2</sub>.
- Control Equipment Malfunction language was incorporated in Appendix E.
- NOx, CO and VOC: Emissions were calculated using manufacturer's information.
- SOx and PM: Emissions were calculated using AIRS, EPA 450/4-90-003

3. Minor Modification, May 10, 2004

- AIRS emission factors were out of date and AP42 provided better information. AP42 emission factors were updated on April 2000 and operating data provided by Solar changed slightly from the data originally provided by the vendor.
- According to the technical evaluation only annual allowable emissions experienced a change which ranged from -1.5 to + 0.6 TPY for each turbine (see Attachment B).
- The lb/hr, lb/MMBtu and ppmvd allowable emissions (short term emissions) were removed from the permit, as well as the equipment malfunction language.

Although the short term emissions were removed from the permit they still are applicable to both turbines. To prevent misunderstandings or confusion over what short term limits apply to each turbine, short term emissions will be incorporated back into each permit.

To adjust for the update in emission factors that occurred in 2004, short term emissions were calculated as follows:

Assumptions:

1. Updated emission factors as stated in the minor modification completed in 2004:

Criteria Pollutant	Emission Factor (lbs/MMscf)	Source of emission factor
PM <sub>10</sub>	6.73	AP 42 Table 3.1-2a, dated 4/00
SO <sub>x</sub>	3.47	AP 42 Table 3.1-2a, dated 4/00
NO <sub>x</sub>	154.07	Manufacturer's data
VOC	6.27	AP 42 Table 3.1-2a, dated 4/00, adjusted with manufacturer's data
CO	111.66	Manufacturer's data

2. Maximum fuel consumption over any consecutive 12 month period: 411 MMscf
3. Heating value: 1,020 Btu/scf (application No. 200400630 & 631)
4. Maximum fuel firing rate (scf/hr): 50,512 at 0 °F (worst case scenario)
5. Maximum Gross Heat Input (MMBtu/hr): 51.52 at 0 °F (worst case scenario)
6. The following equations were used:
  - a. lb/hr: (Maximum fuel firing rate, scf/hr) x (emission factor, lbs/MMscf) x (conversion units)
  - b. TPY: (lb/hr) x (Maximum fuel consumption, MMscf/yr) x (1/Maximum fuel firing rate, hr/scf) x (conversion units)
  - c. lb/MMBtu: (Allowable emission, lb/hr) x (1/Maximum gross heat input, hr/MMBtu)
  - d. Allowable emissions in lb/hr and TPY

Criteria Pollutant	lb/hr	lb/MMBtu	TPY
PM <sub>10</sub>	0.33		1.40
SO <sub>x</sub>	0.18		0.8
NO <sub>x</sub>	7.78	0.15	31.7
VOC	0.32		1.5
CO	5.64		22.9

7. Minor Modification permit (Issued date: 1995) vs minor modification (Issued date: 2004)

Criteria Pollutant	Original		Minor Modification		Delta Δ	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
PM <sub>10</sub>	0.70	2.85	0.33	1.40	- 0.37	-1.45
SO <sub>x</sub>	0.03	0.12	0.18	0.8	+0.15	+0.68
NO <sub>x</sub>	7.76	31.56	7.78	31.7	+0.02	+0.14
VOC	0.28	0.88	0.32	1.5	+0.04	+0.62
CO	13.49	22.87	5.64	22.9	-7.85	+0.03

Conclusion:

The allowable emissions in units of TPY calculated using the methodology described above matched the ones currently in the permit and confirmed the increase/decrease described in the final memorandum from March 29, 2004 (see Attachment B).

8. Additional updates done to the permit are as follows:

Record Keeping

- a. The Permittee shall make and keep records of the Allowable Stack Concentration (ASC) and MASC calculations for the turbine to show compliance with RCSA Section 22a-174-29.
- b. The Permittee shall 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 combustion turbine.
- c. The Permittee shall keep records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of the stationary gas turbine; or any malfunction of the air pollution control equipment [40 CFR §60.7(b)]. Such records shall contain the following information:
  - i. type of event (startup, shutdown, or malfunction);
  - ii. equipment affected;
  - iii. date of event;
  - iv. duration of event (minutes);
  - v. fuel being used during event; and
  - vi. total NO<sub>x</sub> and CO emissions emitted (lb) during the event.
- d. The Permittee shall keep records of stack testing results.
- e. The Permittee shall keep records of manufacturer's information for the low NO<sub>x</sub> burner.

Reporting

- a. The Permittee shall notify the commissioner in writing of any exceedance of an operating parameter, and shall identify the cause or likely cause of such exceedance, all corrective actions and preventive measures taken with respect thereto, and the dates of such actions and measures as follows:
  - i. For any hazardous air pollutant, no later than 24 hours after such exceedance commenced; and
  - ii. For any other regulated air pollutant or operating parameter, no later than ten days after such exceedance commenced.
- b. The Permittee shall notify the commissioner in writing of a deviation from an emission limit (short-term and/or long term) or operational parameter, used as a surrogate, as follows:
  - i. For any hazardous air pollutant, no later than 24 hours after such exceedance commenced; and
  - ii. For any other regulated air pollutant or operating parameter, no later than ten days after such exceedance commenced.

The notification shall include the following:

- i. a description of the circumstances surrounding the cause or likely cause of such deviation; and
- ii. a description of all corrective actions and preventive measures taken and/or planned with respect to such deviation and the dates of such actions and measures.
- iii. the quantity of excess emissions occurring during the event.
- iv. the duration of the event.

Stack Emission Test Requirements:

The updated language clearly states that stack testing is required for NOx and testing schedule.

Special Requirements:

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]

Emission Factors:

The emission factors for PM<sub>10</sub>, SOx and VOC are from Table 3.1-2a not 3.1-1 as stated in current permits.

Changes to the permits were discussed with Mr. John Bins and Ms. Fariba Mehdizadeh from Spectra/Algonquin.

**Permit Fee(s)** (Double Click to edit)

Equipment Size	<input type="radio"/> Major	<input checked="" type="radio"/> Minor
Permit Type	Minor Permit Mod ▼	
Permit Fee	\$1,750	ea.
Municipality	<input type="checkbox"/> Yes	
# of Permits/Applications	2	\$3,500
Application Fee Submitted	<input checked="" type="checkbox"/> Yes - \$1,880	
Was Permit Fee paid with Application Fee?	<input checked="" type="checkbox"/> Yes -1620	

**Additional Application Fees (\$1750 Each)**

	Quantity	
BACT Review	0	\$0
LAER Review	0	\$0

<b>Money Owed</b>	<b>\$0</b>
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**Comments:**

## **Compliance History Review**

Was the SIMS Enforcement Report run and reviewed for this applicant?	Yes
Were other bureaus contacted to resolve any outstanding enforcement actions shown in the SIMS Report?	N/A
What is the date on the Enforcement Section's review of air compliance email?	5/5/2015
Was the compliance record reviewed in accordance with the Environmental Compliance History Policy?	Yes

## **Approvals**

Based on the information submitted by the applicant, this engineering evaluation and the compliance history review, the granting of a permit is recommended for Algonquin Gas Transmission, LLC.

/s/Lidia Howard 5/28/2015  
Lidia Howard  
APCE II

/s/Susan E. Amarello 5/28/2015  
Susan E. Amarello  
Supervising APCE

/s/ Jaimeson Sinclair 5/28/2015  
Jaimeson Sinclair  
Assistant Director