



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:	Hamilton Sundstrand Corporation
Address:	One Hamilton Road, Windsor Locks, CT 06096
Equipment Location:	One Hamilton Road, Windsor Locks, CT 06096
Equipment Description:	Cogeneration Facility Consisting of a 5.4 Megawatt Solar Taurus Gas Turbine, a 31.27 MMBTU/hr Coen Standard Duct Burner and a Rentech Heat Recovery Steam Generator

Town-Permit Numbers:	213-0115
Premises Number:	0002
Modification Issue Date:	April 9, 2013
Prior Permit Issue Dates:	April 9, 2011 - Original permit April 29, 2011 - Revision December 1, 2011 - Minor Modification
Expiration Date:	None

/s/ Anne Gobin for
Daniel C. Esty
Commissioner

April 9, 2013
Date

PERMIT FOR FUEL BURNING EQUIPMENT

DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION BUREAU OF AIR MANAGEMENT

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

Hamilton Sundstrand will install and operate a 5.4 MW combined heat and power (CHP) generation facility at its Windsor Locks facility. The CHP consists of a Solar Taurus 60 combustion turbine with a natural gas fired 31.27 MMBTU/hr Coen Standard duct burner and a Rentech heat recovery steam generator (HRSG). Emissions from the facility will be controlled by a selective catalytic reduction (SCR) unit for NOx control and an oxidation catalyst for CO control.

B. Equipment Design Specifications

Turbine

1. Maximum Fuel Firing Rates¹: 67,078 ft³/hr (natural gas)
420 gal/hr (ULSD)
2. Maximum Gross Heat Input (MMBTU/hr)¹: 67.08 (natural gas)
58.82 (ULSD)²

Duct Burner

1. Maximum Fuel Firing Rate(s)¹: 31,270 ft³/hr (natural gas)
2. Maximum Gross Heat Input (MMBTU/hr)¹: 31.27 @ 1,000 BTU/scf

¹ at ISO conditions: 59°F, 14.7 psia and 60 percent relative humidity

² at HHV of ULSD of 140,037 BTU/gal

C. Control Equipment Design Specifications

1. Selective Catalytic Reduction (SCR)
 - a. Make and Model: Cormetech/Rentech or equivalent
 - b. Catalyst Type: Titania based ceramic honeycomb catalyst or equivalent
2. Oxidation Catalyst
 - a. Make and Model: Emerachem/Rentech or equivalent
 - b. Catalyst Type: Stainless steel monolith with alumina/platinum catalytic coating or equivalent

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PART I. DESIGN SPECIFICATIONS, continued

D. Stack Parameters

1. Minimum Stack Height (ft): 75
2. Minimum Stack Diameter (ft): 4
3. Minimum Exhaust Gas Flow Rate at 100% load (acfm): 54,444
4. Minimum Stack Exit Temperature at 100% load (°F): 260
5. Minimum Distance from Stack to Property Line (ft): 790

PART II. OPERATIONAL CONDITIONS

A. Operating Limits

Turbine

1. Fuel Types: Natural Gas, No. 2 Oil (ULSD)
2. Maximum Fuel Consumption over any Consecutive 12 Month Period:
587.6 MMft³ (natural gas)
420,000 gallons (ULSD)
3. Maximum Oil Sulfur Content (% by weight, dry basis): 0.0015

Duct Burner

1. Fuel Type: Natural gas
2. Maximum Fuel Consumption over any Consecutive 12 Month Period:
274 MMft³ (natural gas)

PART III. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS

A. Monitoring

1. The Permittee shall use individual non-resettable totalizing fuel metering devices or billing meters to continuously monitor fuel feed to the turbine and duct burner.
2. The Permittee shall continuously monitor and continuously record the SCR aqueous 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.

PART III. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS,

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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 once per year, at a minimum, or more frequently if recommended by manufacturer.

B. Record Keeping

1. The Permittee shall keep records of monthly and consecutive 12 month fuel consumption. 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 keep records of (1) the fuel certification for each delivery of fuel oil from a bulk petroleum provider; or (2) performing an analysis using the method found in ASTM D129, or alternatively D1266, D1552, D2622, D4294, or D5453; or (3) 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 the date of delivery, the name of the fuel supplier, type of fuel delivered, the percentage of sulfur in such fuel, by weight, dry basis, and the method used to determine the sulfur content of such fuel.
3. The Permittee shall calculate and record the monthly and consecutive 12 month PM-10/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.
4. Emissions during startup and shutdown shall be counted towards the annual emission limitation in Part V.C of this permit.

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continued

5. The Permittee shall keep records of each delivery of aqueous ammonia. The records shall include the date of delivery, the name of the supplier, the quantity of aqueous ammonia delivered, and the percentage of ammonia in solution, by weight.
6. The Permittee shall keep records of the inspection and maintenance of the SCR and oxidation catalysts. The records shall include the name of the inspector, the date, the results or actions and the date the catalyst is replaced.
7. The Permittee shall keep records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of the stationary gas turbine, duct burner or any malfunction of the air pollution control equipment. [40 CFR §60.7(b)]
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 notify the commissioner in writing of any malfunction of the stationary gas turbine/duct burner or the air pollution control equipment. 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.

PART IV. OPERATION AND MAINTENANCE REQUIREMENTS

- A. The Permittee shall operate and maintain this equipment in accordance with the manufacturer's specifications and written recommendations.

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PART IV. OPERATION AND MAINTENANCE REQUIREMENTS, continued

- B.** The Permittee shall operate and maintain this stationary combustion turbine/duct burner, 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.
- C.** The Permittee shall properly operate the control equipment at all times that this turbine/duct burner is in operation and emitting air pollutants.
- D.** The Permittee shall keep records, when the turbine/duct burner is changed for routine maintenance, to include the following:
1. The date the turbine/duct burner was changed,
 2. The reason for the change,
 3. Documentation that the replacement turbine/duct burner is the same make and model number or equivalent,
 4. Documentation of all associated fixed capital costs, and
 5. Documentation showing that the replacement turbine/duct burner does not result in an increase in emissions, the emission of any new air pollutants, or increases in electrical output of the turbine.

PART V. ALLOWABLE EMISSION LIMITS

The Permittee shall not cause or allow this equipment to exceed the emission limits stated herein:

A. Short Term Emission Limits

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

TURBINE OPERATING ON NATURAL GAS

Criteria	ppmvd		
Pollutants	@15% O ₂	lb/MMBtu	lb/hr
PM ₁₀ /PM _{2.5}		0.017	1.11
SO ₂		6.58E-04	0.04
NO _x	2.5	0.011 ¹	0.74
VOC/HC		7.77E-03	0.52
CO	10.0	0.027 ¹	1.80

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PART V. ALLOWABLE EMISSION LIMITS, continued

TURBINE OPERATING ON ULSD

Criteria	ppmvd		
Pollutants	@15% O ₂	lb/MMBtu	lb/hr
PM ₁₀ /PM _{2.5}		0.019	1.11
SO ₂		1.52E-03	0.09
NO _x	9.6	0.042 ¹	2.49
VOC/HC		0.039	2.29
CO	20.0	0.054 ¹	3.19
Pb		1.40E-05	8.24E-04

TURBINE AND DUCT BURNER OPERATING ON NATURAL GAS

Criteria	ppmvd		
Pollutants	@15% O ₂	lb/MMBtu	lb/hr
PM ₁₀ /PM _{2.5}		0.011	1.11
SO ₂		6.31E-04	0.06
NO _x	2.5	0.010 ¹	0.98
VOC/HC		0.007	0.69
CO	10.0	0.026 ¹	2.60
Pb		1.88E-07	1.53E-05

¹ at ISO conditions: 59 °F, 14.7 psia and 60 percent relative humidity.

FOR ALL OPERATING SCENARIOS

Pollutants	ppmvd @15% O ₂
Ammonia	5.0

B. Startup and Shutdown Emission Limits

The Permittee shall minimize emissions during periods of startup and shutdown by the following work practices and time constraints. Start the ammonia injection as soon as minimum catalyst temperature is reached. The oxidation catalyst shall not be bypassed during startup or shutdown. The duration of startup shall not exceed 60 minutes for a hot start or a warm start, nor 240 minutes for a cold start.

1. A "hot start" shall be defined as startup when the turbine has been down for less than 8 hours.
2. A "warm start" shall be defined as startup when the turbine has been down for more than 8 hours, but less than 24 hours.
3. A "cold start" shall be defined as startup when the turbine has been down for more than 24 hours. The duration of shutdown shall not exceed 60 minutes.

PART V. ALLOWABLE EMISSION LIMITS, continued

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Emissions during these periods shall be counted towards the annual emission limits stated herein.

C. Annual Emission Limits

Criteria Pollutants	tons per 12 consecutive months
PM ₁₀ /PM _{2.5}	4.86
SO ₂	0.27
NO _x	5.26
VOC/HC	3.82
CO	11.39

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 RCSCA Section 22a-174-29. [STATE ONLY REQUIREMENT]

E. OPACITY: This equipment shall not exceed 10% opacity during any six minute block average as measured, if required by the commissioner, by 40 CFR 60, Appendix A, Reference Method 9.

Demonstration of compliance with the above emission limits shall be met by calculating the emission rates using emission factors from the following sources:

1. NO_x, CO, Ammonia: stack test data.
2. PM-10/PM-2.5: 1.11 lb/hr (0.019 lb/MMBTU): Emission factors are from screening modeling recommendation approved by DEEP on August 5, 2011(See evaluation for minor modification to Permit No. 213-0115 - Application No. 201101730).
3. SO₂, VOC, HAPs: Turbine: Compilation of Air Pollutant Emission Factors, AP-42, fifth edition, Section 3.1, April 2000, or most recent revision, or equipment manufacturer data.
Duct burner: Compilation of Air Pollutant Emission Factors, AP-42, fifth edition, Section 1.4, July 1998, or most recent revision, or equipment manufacturer data.

PART V. ALLOWABLE EMISSION LIMITS, continued

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4. CO (startup/shutdown): Natural Gas 15.7/6.9 lb/event
ULSD 24.5/9.6 lb/event
5. NO_x (startup/shutdown): Natural Gas 0.8/0.4 lb/event
ULSD 1.7/0.8 lb/event

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 testing shall be performed in accordance with the latest Emission Test Guidelines available on the DEP website:

http://www.ct.gov/dep/cwp/view.asp?a=2684&q=322076&depNav_GID=1619

- B. Initial stack testing was done for the following pollutants:

NO_x CO Other (HAPs): Ammonia

- C. Annual/biennial stack testing for NO_x shall be performed to demonstrate compliance with the NO_x emission limits in accordance with 40 CFR §60.4400.
- D. Recurrent stack testing for NO_x, CO and ammonia shall be conducted within five years from the date of the previous stack test to demonstrate compliance with their respective limits.
- E. Stack testing shall be conducted for the following operating modes: (1) turbine on natural gas, (2) turbine on ULSD, and (3) turbine and duct burner on natural gas.
- F. Stack test results shall be reported as follows: all pollutants in units of lb/hr, NO_x and CO in units of ppmvd at 15% O₂, ammonia in units of µg/m³ and ppmvd at 15% O₂.

PART VII. SPECIAL REQUIREMENTS

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- A. The Permittee shall comply with all applicable sections of the following New Source Performance Standard 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. STATE ONLY REQUIREMENT: 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.
- C. In the event that a malfunction causing either an emission exceedence or a parameter monitored out of recommended range is not corrected within three hours, the Permittee shall immediately institute shutdown of the turbine/duct burner.

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.

PART VIII. ADDITIONAL TERMS AND CONDITIONS, continued

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- 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

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- 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.

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