	PERMIT APPLICATION REVIEW SUMMARY	New Hampshire Department of Environmental Services Air Resources Division P.O. Box 95, 29 Hazen Drive Concord, NH 03302-0095 Phone: 603-271-1370 Fax: 603-271-7053

Facility:	Bridgewater Power Company			**Engineer:**	Sarita Croce	
Location:	300 Route 3, Bridgewater, NH 03222			**Phone #:**	(603) 271-6893	
AFS #:	3300900021	**Application #:**	10-0141	**Date:**	5/5/2012	Page 1 of 7

PROJECT DESCRIPTION

Bridgewater Power Company (BPC) submitted a renewal application (10-0141) for the Title V permit TV-OP-008.

FACILITY DESCRIPTION/PERMIT HISTORY

The Bridgewater facility in Bridgewater is a small electric power generating facility, producing 15 megawatts electricity net output. The Bridgewater facility has a 250 MMBtu/hr wood-fired boiler, which is a Foster Wheeler design, vibrating grate, stoker type boiler with an associated circulating water cooling pond. In addition, the facility has a 269 HP emergency generator that provides emergency lighting at the facility. There is also an emergency diesel fire pump rated at 1.1 MMBtu/hr gross heat input rate (121 HP) located at the facility for fire prevention. The facility exceeds the Title V thresholds for NOx and CO.

The following is a summary of the permit history:

Table 1 – Permitting History

EU	Device	Permit Number	Permit Issued	Permit Expires	Status
PCE04 & PCE05	Installation of a RSCR system (PCE4) and SNCR system (PCE5)	TP-B-0533	09/12/07	03/31/09	Temporary Permit for control equipment
PCE04 & PCE05	Installation of a RSCR system (PCE4) and SNCR system (PCE5)	TP-B-0533	11/09/07	03/31/09	Minor amendment to Temporary Permit, change in operating range of the RSCR temperature
EU01 thru EU04	Wood-fired Boiler, Emergency Generator, Emergency Fire Pump, and Cooling Pond.	TV-OP-008	03/22/06	03/31/11	Title V Operating Permit
PCE04	Regenerative Selective Catalytic Reduction (RSCR) system voluntarily installed by BPC for nitrogen oxide (NOx) emission reductions	TV-OP-008	8/17/2009	3/31/11	Permit modification incorporating the Regenerative Selective Catalytic Reduction (RSCR/TP-B-0533) system voluntarily for nitrogen oxide (NOx) emission reductions into Title V Operating Permit TV-OP-008. An economizer was also installed, which is not considered PCE. Because of the heat recovery, the exhaust temp was reduced from 325°F to 200°F and therefore modeling was conducted to verify that the facility would still be in compliance with all ambient air quality criteria. The predicted impacts were below the applicable AAQS and AALs. The facility decided not to install the SNCR. Only the RSCR was installed.

CHANGES FROM PREVIOUS PERMIT

- Inclusion of 40 CFR Part 63 Subpart JJJJJJ, requirements for area sources of HAPs for boilers.
- Inclusion of 40 CFR Part 63, Subpart ZZZZ, requirements for internal combustion engines.

PROCESS/DEVICE DESCRIPTION

Table 2 – Significant Activities

Emission Unit Number	Description of Emission Unit	Install Date	Maximum Design Capacity and Fuel Type(s)[1]
EU01	Wood/Oil-fired Boiler Foster Wheeler Model Unknown Serial # 6770 Peabody Engineering Burner Model BCT AA Burner Serial # Unknown	1987	250 MMBtu/hr Equivalent to 165,000 lb steam/hr averaged over a 24-hour period at 850°F, 695 psig, with a boiler efficiency of 68%, boiler feedwater temperature of 340°F, and chip moisture content of 50% ▪ Whole tree wood chips and mill residue at approximately 8.8 MMBtu/ton (at 50% moisture); ▪ Untreated wood fuel[2] ranging from approximately 8.8 to 14 MMBtu/ton at 20-50% moisture; ▪ No. 2 fuel oil; and ▪ On-spec used oil.
EU02	Emergency Generator Caterpillar Model # 3208TB Serial # 30A0223	1987	1.8 MMBtu/hr Max. fuel usage = 13.1 gal/hr diesel fuel 269 HP
EU03	Emergency Fire Pump Caterpillar Model # 3208 Serial # 90N69074	1987	1.1 MMBtu/hr Max. fuel usage = 8.0 gal/hr 121 HP
EU04	Cooling Pond	1987	Drift Factor =0.0012% Circulation Rate=15,800 gpm
EU05	3 MMBtu/hr Package Boiler [3]	1987	Maximum fuel usage = 21.42 gal/hr No. 2 fuel oil Annual usage has remained between 10,000 to 12,000 gal/yr over the last 10 years.
.			

LIST OF INSIGNIFICANT ACTIVITIES

[1] The hourly gross heat input rates presented in Table 1 are set assuming a higher heating value of 140,000 Btu/gal for No. 2 fuel oil or On-spec oil, and 137,000 Btu/gal for diesel fuel.

[2] "Untreated wood" means any timber, board or sawn dimensional lumber which has not been treated, coated or preserved. This term does not include any manufactured building material, such as plywood or waferboard.

[3] This device is below the permitting threshold per Env-A 607. The device is subject to 40 CFR 63 Subpart JJJJJJ, and therefore has been included in Table 1 as a significant activity.

The following is a summary of insignificant activities:

Table 3: Insignificant Activities		
Activity	**Description**	**Emissions/Reason Insignificant**
Wood Chip Handling	Transfer and Handling of Wood Fuel	<1,000 lbs/yr
No. 2 Fuel Oil Tank	10,000 gallon #2 Fuel Oil Tank	< 1,000 lbs/yr

POLLUTION CONTROL EQUIPMENT

Table 4 – Pollution Control Equipment Identification		
Pollution Control Equipment Number (PCE#)	**Description of Equipment**	**Activity**
PCE1	Multi-cyclone (Multiclone)	Primary particulate matter control for EU01.
PCE2	Gravel Bed Filter (GBF)	Secondary particulate matter control for EU01.
PCE3	Baghouse-Reverse Jet Pulse	Final particulate matter control for PCE2.
PCE4	Regenerative Selective Catalytic Reduction (RSCR) System	Nitrogen oxide control for EU01.

Regenerative Selective Catalytic Reduction System

Ammonia flow and the RSCR system catalyst bed temperature are the two key operating parameters for NO_x removal. The optimum RSCR catalyst bed temperature ranges between 350 to 650 degrees F. Ammonia flow to the RSCR is critical to removal of NO_x and its addition rate into the boiler exhaust is dependent on the rate of NO_x formation, which in turn is a function of air-fuel mixture and good combustion.. Once the Boiler is in operation, the facility may develop typical ammonia flow (gal/hr) to outgoing NO_x (lb/hr) ratio setpoints for optimum NO_x removal.

EMISSION CALCULATIONS

Wood-fired Boiler (EU01)

Pollutant	**Emission Factor or Regulatory Limit**	**Basis**	**Emission Rates**	
	lb/MMBtu		**lb/hr**	**tons/yr**
TSP/PM10	0.10	NSPS Subpart Db	25.0	109.5
	0.065	**August 2009 Test x 1.1[a]**	**17.4**	**76.1**

Pollutant	Emission Factor or Regulatory Limit	Basis	Emission Rates	
	lb/MMBtu		lb/hr	tons/yr
SO2	0.025	AP-42, Chapter 1.6	6.25	27.38
	0.0022	**August 2009 Test x 1.1[a]**	**0.55**	**2.41.**
NOx	-	PSD avoidance	57	< 250
	0.0781	**August 2011 Test x 1.1[a] - With RSCR**	**19.53**	**85.52**
CO	-	PSD avoidance	57	< 250
	0.1991	**August 2011 Test x 1.1[a]**	**49.775**	**218.01**
VOC	**0.00132**	**August 2011 Test x 1.1[a]**	**0.33**	**1.45**
Ammonia	20 ppmdv@6%O2	Permit limit (TP-B-0533)	3.77	16.51
	0.583 ppmdv@6%O2	**August 2011 Test x 1.1[a]**	**0.08**	**0.35**

Ammonia emission rate = $20/10^6$ x 17 lb/lb-mole x 1 lb-mole/385.3 dscf x 9,240 dscf/MMBtu x (20.9/20.9-6%) x 220 MMBtu/hr = 2.52 lb/hr (Note: f-factor for wood is 9,240 dscf/MMBtu)

a - stack test results in lb/MMBtu and lb/hr adjusted by a factor of 1.1 (ten percent margin) to account for normal variation in results; lb/hr values are measured/actual data and associated annual emissions in tons/yr assume 8760 hours of operation; data are in **bold** above.

Emergency Engines

Emergency Generator (EU02)

The emergency generator (EU02) and fire pump (EU03) engines are limited to 500 hours per year of operation to qualify as emergency generators as defined under Env-A 101.671. Maximum annual permitted emissions for the noted number of operating hours were developed using EPA's AP-42 emission factors (Chapter 3.3 Gasoline and Diesel Industrial Engines (updated 10/96)).

Pollutant	Emission factor	Max Heat Input	Potential Emissions 500 hr/yr
	lb/MMBtu	MMBtu/hr	tons/yr
PM10	0.31	1.8	0.14
SO_2	0.29	1.8	0.13
NOx	3.56	1.8	1.60
CO	0.95	1.8	0.43
VOC	0.35	1.8	0.16

Fire Pump (EU03)

Pollutant	Emission factor	Max Heat Input	Potential Emissions 500 hr/yr
	lb/MMBtu	MMBtu/hr	tons/yr
PM10	0.31	1.1	0.09
SO_2	0.29	1.1	0.08

Pollutant	Emission factor	Max Heat Input	Potential Emissions 500 hr/yr
	lb/MMBtu	MMBtu/hr	tons/yr
NOx	3.56	1.1	0.98
CO	0.95	1.1	0.26
VOC	0.35	1.1	0.10

Total Potential Emissions for Combustion Devices

Pollutant	tons/year				
	PM	SO2	NOx	CO	VOC
Emergency Generator	0.14	0.13	1.60	0.43	0.16
Emergency Fire Pump	0.09	0.08	0.98	0.26	0.10
Boiler without RSCR	109.5	27.38	<250	<250	1.45
Total without RSCR	109.5	27.59	<250	<250	1.70

Potential to emit is based on federally enforceable limits identified in the previous tables.

Cooling Pond Emissions RTAPs

Chemical	CAS #	De Minimis lb/day	De Minimis lb/yr	24-hr AAL ug/m3	Annual AAL ug/m3	Max Usage lb/day
Sodium Hydroxide	1310-73-2	0.39	143	33	20	14.5
Sulfuric Acid	7664-93-9	0.0084	3.1	0.71	0.48	42.8
Propylene Glycol	107-98-2	24	8673	2000	2000	3.1
Polyethylene Glycol	25322-68-3	2.5	597	208	99	1.3
Morpholine	110-91-8	4.2	1548	357	238	0.41
Potassium Hydroxide	1310-58-3	0.13	48	11	6.7	0.8
The RTAP evaluation was completed by Craig Clarke of Bridgewater Power.						

RTAP COMPLIANCE

Attached is the 1400 compliance demonstration.

STACK INFORMATION

Table 5 – Stack Information						
Stack Number	**Emission Unit Number**	**Emission Unit Description**	**Minimum Stack Height Above Ground Level (Feet)**	**Maximum Inside Stack Diameter (Feet)**	**Exhaust Air Flow (ACFM)**	**Stack Discharge Temp (deg F)**
Stack #1	EU1	Boiler	196.5	6.0	120,000	200

MODELING

The facility was last modeled in July 2009 for criteria pollutants and RTAPs for its permitted wood-fired boiler. In addition to burning wood the boiler can also combust waste oil at a permitted fuel limit of 4,286 gal/day of on-spec oil. The facility is not making any changes to its operations but since the last modeling analysis, the AAL for one of the RTAPs (lead) has changed. The modeling unit revisited the lead impacts to determine if the current permit limit

needs to be adjusted.

The 2009 modeling analysis predicted maximum 24-hour lead impacts to be below the AAL of 0.18 ug/m^3. Using the lower lead AAL of 0.15 ug/m^3 adopted on November 25, 2009, the maximum lead impacts are predicted to exceed the ambient air limit at the current daily waste oil permit limit, though only by a small amount. By scaling the results of the 2009 modeling, a new permit limit of 4,187 gal/day of waste oil would be required to meet the 24-hour AAL.

EMISSION TESTING

Ammonia slip and RATA testing was conducted in August 2011. The result of ammonia slip was 0.53 ppm[4] which is below the permit limit of 20 ppm.

EMISSIONS MONITORING EQUIPMENT

There were no changes to monitoring equipment at the facility. The facility has a continuous opacity monitoring system (COMS) on the Boiler, which is required by 40 CFR 60 Subpart Db. The facility also has continuous emissions monitoring systems for NO_x and CO and diluent gas, O_2, to demonstrate compliance with NO_x and CO limits.

SITE VISITS/INSPECTIONS

Date	**Description**
04/17/08	On-site site inspection was conducted. Issues were identified with the 2007 annual emissions report. Bridgewater corrected the issues and resubmitted the report.
09/24/10	Off-site inspection was conducted of the facility. No deficiencies were identified.
12/21/2011	Permitting staff site visit.

REPORTS/FEES

Fees

DES received a check from Bridgewater on April 9, 2012 for emissions-based fees for calendar year 2011.

REVIEW OF REGULATIONS

State Regulations

- Env-A 609 – *Title V Operating Permits* – Applicable – This facility exceeds the Title V permitting thresholds for CO and NOx and is required to have a Title V Operating Permit.
- Env-A 618 & 619 – *Additional Requirements in Non-Attainment Areas and the New*
- *Hampshire Portion of the Northeast Ozone Transport Region& Prevention of Significant Deterioration* (*PSD) of Air Quality Permit Requirements* – Not Applicable – The facility has not proposed any modifications that would trigger New Source Review as part of this application.
- Env-A 624- *Permits For The Combustion of Non-Exempt Fuel* – Not Applicable - A source is not subject to this requirement if the device at an affected source that, as of June 29, 2005, is allowed by permit to combust non-exempt fuel unless there is a material modification of such device after that date. Per Section 125-C:10-b, a material modification refers to physical modifications made to the device.
- Env-A 700 – *Permit Fee System* – Applicable – The facility must pay emissions-based fees, annually.
- Env-A 800 – *Testing and Monitoring Procedures* – Applicable – Fuel sulfur content verification is required, and CEMs monitoring requirements.
- Env-Hw807.06 and 807.10 – *Standards for Generator's of Used Oil Being Recycled and Standards for Burner's of Used Oil Fuel Requirements* – Applicable – Specifications for on-site generated used oil to meet for being

[4] The ammonia concentration is reported as dry concentration which was adjusted to 6% O_2.

considered on-specification used oil, testing of each batch of on-site generated used oil prior to burning it

- Env-A 900 – *Owner/Operator Recordkeeping and Reporting Obligations* – Applicable – Annual emissions report.
- Env-A 1301.02(j)(1) – *Emergency Engine Requirements* – Applicable to the Emergency Generator and Emergency Fire Pump – Less than 500 hours of operation
- Env-A 1305.02 – *NOx RACT Requirements for Industrial Boilers* – Applicable to Boiler
- Env-A 1400 – *Regulated Toxic Air Pollutants* – Applicable – Bridgewater Power can burn on-site generated used oil in its boiler, so emissions unit EU01 is subject to Env-A 1400. Based on modeling a daily limit of 4,187 gal/day is required to show compliance with AAL. Ammonia slip is also subject to Env-A 1400.
- Env-A 1600 – *Fuel Sulfur Limits* – Applicable – Sulfur limit applies to No. 2 fuel oil.
- Env-A 2000 – *Fuel Burning Devices* – Applicable to EU01, EU02, EU03 – Opacity and particulate matter emissions limitations

Federal Regulations

NSPS Subpart Db – Applicable - NSPS for Industrial-Commercial-Institutional Steam Generating Units for Which Construction, Modification, or Reconstruction is Commenced After June 19, 1984 – The boiler was installed in 1987 and is therefore subject to the requirements.

40 CFR §60.11(d) – Applicable -At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

40 CFR §60.11(g) - Applicable - For the purpose of submitting compliance certifications or establishing whether or not a person has violated or is in violation of any standard in this part, nothing in this part shall preclude the use, including the exclusive use, of any credible evidence or information, relevant to whether a source would have been in compliance with applicable requirements if the appropriate performance or compliance test or procedure had been performed.

40 CFR 63 National Emissions Standards for Hazardous Air Pollutants – The facility is a true minor source of HAPs.

40 CFR 63, Subpart JJJJJJ (NESHAP for Area Sources: Industrial, Commercial, and Institutional Boilers) – Applicable – The wood-fired boiler is considered an existing source because the construction of the boiler occurred prior to June 4, 2010. Therefore, the wood-fired boiler is subject to the biennial tune-up and one time energy assessment (applicable only to boilers ≥10 MMBtu/hr) requirements of 40 CFR 63, Subpart JJJJJJ. The oil-fired 3 MMBtu/hr package boiler is considered an existing device. The package boiler is only subject to tune-up requirements of the rule.

40 CFR 63, Subpart DDDDD (NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters) – Not Applicable – The Facility is a minor source of HAPs.

40 CFR 63 Subpart ZZZZ, *National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines* - Applicable - The emergency engines were manufactured prior to June 12, 2006, and need to meet the requirements of 40 CFR 63 Subpart ZZZZ by May 3, 2013.

40 CFR 64 (Compliance Assurance Monitoring) – Applicable – The CAM rule applies to Title V sources that operate emission units with pre-controlled potential emissions at or above the Title V major source thresholds that rely on control devices to comply with applicable requirements. This facility does operate air pollution control devices. Therefore, the CAM rule is applicable. CAM is applicable to particulate matter. CAM is not applicable to NOx because NOx emissions are continuously monitored.