REGIONAL HAZE REASONABLE PROGRESS FOUR-FACTOR ANALYSIS

Green Mountain Power Corporation
Unit No. 5 in Berlin, VT (Berlin 5)
Unit No. 16 in Colchester, VT (Gorge 16)

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1. INTRODUCTION

Trinity Consultants (Trinity) prepared the four-factor analysis (4FA) documented in this report on behalf of Green Mountain Power Corporation (GMP) in response to the November 16, 2020 request from the Vermont Department of Environmental Conservation (VDEC).[1] Per the November 16, 2020 request, this report provides information related to emissions of nitrogen oxides (NO_X) and possible emission reduction options for GMP's Unit No. 5 in Berlin, VT (Berlin 5) and Unit No. 16 in Colchester, VT (Gorge 16).

Berlin 5 currently operates under the authority of VDEC *Air Pollution Control Permit to Operate and CO_2 Budget Permit* No. OP-17-028 (the Berlin 5 permit). The facility consists of two simple-cycle combustion turbines (SCCTs) coupled to a single 50-megawatt (MW) rated electric generator that operates for peak load (or peaking) electric power generation. The first SCCT, called the "A Engine", is a Pratt & Whitney FT4C-1 with a maximum heat input capacity of 385.1 million British thermal units per hour (MMBtu/hr). The second SCCT, called the "B Engine", is a Pratt & Whitney FT4A-11 with a maximum heat input capacity of 355.5 MMBtu/hr. Both combustion SCCTs were installed in 1972. The SCCTs combust kerosene, biodiesel fuel blends (not to exceed B20), and lighter grade distillate oils (sulfur content not to exceed 0.0015 percent). The total fuel combustion for the two SCCTs is limited to 2,240,000 gallons per year, and NO_X emissions from the facility are limited to less than 100 tons per year (tpy).

Gorge 16 currently operates under the authority of VDEC *Air Pollution Control Permit to Operate* No. OP-18-002 (the Gorge 16 permit). The facility consists of one SCCT, also called Gorge 16, a General Electric Frame 5 with a maximum heat input capacity of 334 MMBtu/hr. The SCCT is coupled to a 17-MW electric generator that provides peak load (or peaking) electric power generation. The SCCT was installed in 1964, and it combusts No. 2 fuel oil (sulfur content not to exceed 0.0015 percent) and biodiesel fuel blends (not to exceed B20). The facility is limited to 1,600,000 gallons per year of fuel combustion, and NO_X emissions from the facility are limited to less than 100 tpy.

Compliance with the fuel usage and NO_X emissions limits is managed through limited operation. Due to their age and limited operation and emissions, none of the three SCCTs are currently equipped with any NO_X emission reduction technologies.

The following technical and economic information, where applicable, is provided in this report for each emission reduction option considered in accordance with the November 16, 2020 request to use a top-down approach for the 4FA:

- Technical feasibility
- Control effectiveness
- Time necessary for implementation[2]
- Remaining useful life[2]
- Energy and non-air quality environmental impacts[2]
- Costs of implementation[2]

[1] Letter from Heidi Hales, PhD, Director, VDEC, to John Greenan, GMP, *Green Mountain Power Units Four-Factor Analysis for Regional Haze*, November 16, 2020.

[2] These are the four factors that must be included in evaluating emission reduction measures necessary to make reasonable progress determinations. *See* 40 CFR 51.308(f)(2)(i).

2. TECHNICAL FEASIBILITY

Based on industry knowledge and reviews of (a) U.S. Environmental Protection Agency (EPA) information, including the *Alternative Control Techniques Document – NO_X Emissions from Stationary Gas Turbines* (the "ACT Document"),[3] the *Air Pollution Control Technology Fact Sheet* publications,[4] the EPA *Air Pollution Control Cost Manual* (CCM),[5] (b) other agency information, including the Northeast States for Coordinated Air Use Management (NESCAUM) *Status Report on NO_X Controls* (NESCAUM Report),[6] (c) and multiple queries of the Reasonably Available Control Technology (RACT), Best Available Control Technology (BACT), and Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC) database[7], the results of which are included in Appendix A, the following NO_X emission reduction options (beyond the currently employed good combustion practices) are evaluated as potentially applicable for the Berlin 5 and Gorge 16 SCCTs.

- Combustion Controls
  - Dry Low-NO_X (DLN) Combustion
  - Water or Steam Injection
- Post-Combustion ("Add-On") Controls
  - Selective Non-Catalytic Reduction (SNCR)
  - Selective Catalytic Reduction (SCR)

2.1 Combustion Controls

Combustion controls refer to the reduction of NO_X formation through the reduction of combustion temperatures. There are two general combustion control techniques for combustion turbines: DLN Combustion and Water or Steam Injection.

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[3] U.S. EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, *Alternative Control Techniques Document – NO_X Emissions from Stationary Gas Turbines*, EPA-453/R-93-007, January 1993, available (as of December 2, 2020) on EPA's Clean Air Technology Center (CATC) webpage at https://www.epa.gov/catc/clean-air-technology-center-products.

[4] The *Air Pollution Control Technology Fact Sheet* publications are available (as of December 2, 2020) on EPA's CATC webpage at https://www.epa.gov/catc/clean-air-technology-center-products.

[5] The *Air Pollution Control Cost Manual* is available (as of December 2, 2020) at https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution.

[6] NESCAUM, *Status Report on NO_X Controls for Gas Turbines, Cement Kilns, Industrial Boilers, and Internal Combustion Engines*, December 2000.

[7] The following five process type and process keyword-based queries were conducted on December 2, 2020 for determinations between 1/1/1970 and 11/30/2020:

- Process Types: 15.190 for large simple-cycle combustion turbines combusting liquid fuels and 16.190 for small simple-cycle combustion turbines combusting liquid fuels
- Process Keywords: simple cycle, peaking, and peak load

The results were filtered to exclude determinations for (a) pollutants other than NO_X, (b) processes other than SCCTs, (c) fuels other than kerosene, diesel, biodiesel, No. 2 fuel oil, and light distillate, and (d) unit sizes greater than or equal to 100 MW and/or 1,000 MMBtu/hr so that a total of 73 unique entries remain.

2.1.1 DLN Combustion

From the ACT Document, at page 2-4, "two [DLN Combustion] designs, lean premixed combustion and rich/quench/lean staged combustion[,] have been developed." For the first design, "premixing results in a homogeneous air/fuel mixture, which minimizes localized fuel-rich pockets that produce elevated combustion temperatures and higher NO_X emissions." At page 2-7, "lean premixed combustors are currently available from several turbine manufacturers for a limited number of turbine models" and "all turbine manufacturers state that lean premixed combustors are designed for retrofit to existing installations." For the "second dry-low NO_X combustion design…[a]ir and fuel are partially combusted in a fuel-rich primary stage, the combustion products are then rapidly quenched using water or air, and combustion is completed in a fuel-lean secondary stage." The NESCAUM Report, at II-12 and II-14, states: "[s]ince fuel oil cannot be easily premixed, it is not typically suitable as a DLN fuel" and "[t]he NOx reduction benefit of DLN is achievable with fuels that can be premixed and are low in fuel nitrogen content, such as natural gas."

Based on information from EPA and NESCAUM, the technical feasibility of DLN is questionable for the Berlin 5 and Gorge 16 SCCTs. However, DLN (or an apparently synonymous term) appears in six of the 73 RBLC entries in Appendix A. For the purposes of this evaluation, DLN is considered to be technically feasible for the Berlin 5 and Gorge 16 SCCTs. A unit-specific controls investigations would be needed to confirm the feasibility of DLN. Such an investigation is expected to take two months. GMP reserves the right to conduct such an investigation and update this report if VDEC needs additional information or decides to require the installation of DLN on any of the units.

2.1.2 Water or Steam Injection

From the ACT Document, at pages 2-2 – 2-4, "water or steam…is injected into the combustor and acts as a heat sink to lower flame temperatures." Further, "This control technique…can be retrofitted to most existing installations." Additionally, the NESCAUM Report, at II-15, states: "Injection of water or steam into the combustor…can be used with any fuel. Steam injection is useful only on applications where a boiler is present, such as Combined Cycle Gas Turbines."

For the purposes of this evaluation, Water Injection is considered technically feasible for the Berlin 5 and Gorge 16 SCCTs. As with DLN, a two-month, unit-specific controls investigations would be needed to confirm the feasibility of Water Injection, and GMP reserves the right to conduct such an investigation and update this report if VDEC needs additional information or decides to require the installation of Water Injection on any of the units.

Furthermore, because of the relative lack of information for DLN compared to Water Injection for oil-fired peak load combustion turbines, Water Injection is considered the preferred Combustion Control technique for the purposes of this report.

2.2 Post-Combustion Controls

2.2.1 SNCR

From the ACT Document, at page 5-87, "[SNCR] is an add-on technology that reduces NO_X using ammonia or urea injection…[at] operating temperature[s] of 870 to 1200 °C (1600 to 2200 °F) to …[a] temperature window…[that] is not compatible with gas turbine exhaust temperatures…[and] the residence time required for the reaction is…relatively slow for gas turbine operating flow velocities." Moreover, the EPA *Air Pollution*

Control Technology Fact Sheet for SNCR indicates that SNCR is not suited for combustion turbines.[8] The CCM, at Section 4, Chapter 1, page 1-5, says "SNCR is generally not used for gas turbines" and the NESCAUM report does not list SNCR as an option for combustion turbines. No determinations for SNCR were found in the RBLC queries. For these reasons, SNCR is determined to be technically infeasible for the Berlin 5 and Gorge 16 SCCTs, and SNCR is not evaluated further in this analysis.

2.2.2 SCR

From the ACT Document, at page 2-8, "[t]his flue gas treatment technique uses an ammonia (NH_3) injection system and a catalytic reactor to reduce NO_X. The EPA *Air Pollution Control Technology Fact Sheet* for SCR states, "SCR is a widely used technology for large gas turbines" and it lists an optimum flue gas temperature range of 480 °F to 800 °F.[9] Based on averages of stack temperatures taken during a July 2000 test of the Berlin 5 A Engine and B Engine, the exhaust temperature of GMP's SCCTs is 751 to 827 °F. SCR is considered technically feasible for the Berlin 5 and Gorge 16 SCCTs.

[8] U.S. EPA, *Air Pollution Control Technology Fact Sheet*, EPA-452/F-03-031.

[9] U.S. EPA, *Air Pollution Control Technology Fact Sheet*, EPA-452/F-03-032.

3. CONTROL EFFECTIVENESS

3.1 Baseline Emissions

The November 16, 2020 request specifies that calendar year 2019 emissions are to be used as the "baseline to evaluate cost and feasibility of additional controls measures." Table 3-1 summarizes the calendar year 2019 operation for each of the three SCCTs and the NO_X emissions based on records of 2019 total heat input and NO_X emission factors from the respective permits.

Table 3-1. Baseline NO_X Emissions

Unit	2019 Operation (Hours/yr)	2019 Total Heat Input (MMBtu/yr)	NO_X Emission Factor (lb/MMBtu)	2019 Total NO_X Emissions (tpy)
Berlin 5 A Engine	10.9	2,874	0.63	0.91
Berlin 5 B Engine	11.4	2,190	0.65	0.71
Gorge 16	28.9	2,977	0.88	1.31

As shown above, the baseline emissions from which any controls are to be evaluated are extremely small. Therefore, any emission reductions potentially achievable at the units would clearly be insignificant. Nevertheless, the control options identified in Section 2 are fully evaluated below and in subsequent report sections in accordance with the November 16, 2020 request.

3.2 Controlled Emissions

3.2.1 Combustion Controls: Water Injection

The November 16, 2020 request, quoting from the *2017 MANE-VU Ask*[10], presents 96 ppm as a NO_X emissions standard for fuel-oil fired peaking combustion turbines. This value is consistent with the range provided in the NESCAUM report, at II-15, for Water Injection ("[w]hen firing distillate oil, water/steam-to-fuel ratios range from 0.46 to 2.28 and achieve controlled NO[x] emission levels ranging from 42 to 110 ppm at 15% oxygen"). This concentration value is equivalent to an emission factor of 0.11 pounds per MMBtu (lb/MMBtu),[11] which represents 84 to 92 percent control efficiency compared to the baseline emissions.

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[10] *Statement of the Mid-Atlantic/Northeast Visibilty Union (MANE-VU) States Conerning a Course of Action Within MANE-VU Toward Assuring Reasonable Progress for the Second Regional Haze Implementation Period (2018-2028)*, August 25, 2017.

[11] Assuming standard conditions of 59 °F and 14.7 psia, using NO_2 as NO_X, and based on the 40 CFR Part 75 f-factor for oil, the calculations is as follows: 96 $dscf_{NOX}$ ÷ 1,000,000 $dscf_{air}$ ÷ 10.731 psia-$dscf_{NOX}$/$lbmol_{NOX}$-R ÷ (59+459) R × 14.7 psia × 46 lb_{NOX}/$lbmol_{NOX}$ × 9190 $dscf_{air}$/MMBtu.

For completeness, a second-tier emission rate of 42 ppm or 0.05 lb/MMBtu, representing 93 to 96 percent control efficiency, is also evaluated for Water Injection. This emission rate is the most common rate found in the RBLC and is the lowest of the range provided by NESCAUM.

3.2.2 SCR

Based on EPA's *Air Pollution Control Technology Fact Sheet* for SCR, "SCR is capable of NO_X reduction efficiencies in the range of 70% to 90%." For the purposes of this evaluation, the range high value of 90% is used, which results in controlled emission factors of 0.063 lb/MMBtu, 0.065 lb/MMBtu, and 0.088 lb/MMBtu for the Berlin 5 A Engine, Berlin 5 B Engine, and Gorge 16 SCCTs, respectively.

3.2.3 Water Injection + SCR

Because SCR can be applied to turbines with or without combustion controls, a combined control option consisting of both Water Injection and SCR is evaluated. An emission factor of 0.01 lb/MMBtu, representing 98 to 99 percent control efficiency, is used to represent the potential level of emissions achievable through the implementation of both control options.

It should be noted that none of the emissions levels evaluated in this report are confirmed to be possible at the Berlin 5 A Engine, Berlin 5 B Engine, and Gorge 16 SCCTs. A two-month, unit-specific controls investigation would be needed to confirm the level of emissions possible upon installation of any control options, and GMP reserves the right to conduct such an investigation and update this report if VDEC needs additional information or decides to require the installation of controls on any of the units.

3.3 Ranking of Control Options

Table 3-2 summarizes and ranks (top-down) the controlled emission rates for the NO_X emission reduction options.

Table 3-2. Control Effectiveness of NO_X Emission Reduction Options

NO_X Emission Reduction Option	Berlin 5 A Engine Controlled Emission Rate (lb/MMBtu)	Berlin 5 B Engine Controlled Emission Rate (lb/MMBtu)	Gorge 16 Controlled Emission Rate (lb/MMBtu)
Water Injection + SCR	0.01	0.01	0.01
Water Injection (0.05)	0.05	0.05	0.05
SCR	0.063	0.065	0.088
Water Injection (0.11)	0.11	0.11	0.11

Table 3-3 presents the unit-by-unit controlled emission rates and emission reduction values for the NO_X emission reduction options.

Table 3-3. Controlled Emissions and Emission Reduction Potentials

Unit	NO_X Emission Reduction Option	Controlled NO_X Emission Rate (tpy)	NO_X Emission Reduction (tpy)
Berlin 5 A Engine	Water Injection + SCR	0.01	0.89
Berlin 5 A Engine	Water Injection 0.05	0.07	0.83
Berlin 5 A Engine	SCR	0.09	0.81
Berlin 5 A Engine	Water Injection 0.11	0.16	0.75
Berlin 5 B Engine	Water Injection + SCR	0.01	0.70
Berlin 5 B Engine	Water Injection 0.05	0.05	0.66
Berlin 5 B Engine	SCR	0.07	0.64
Berlin 5 B Engine	Water Injection 0.11	0.12	0.59
Gorge 16	Water Injection + SCR	0.01	1.29
Gorge 16	Water Injection 0.05	0.07	1.24
Gorge 16	SCR	0.13	1.18
Gorge 16	Water Injection 0.11	0.16	1.15

4. TIME NECESSARY FOR IMPLEMENTATION

If controls are required, five (5) years, counting from the effective date of an approved determination, is requested for implementation, especially if controls are to be applied on multiple units. This implementation timeframe was standard in the regional haze first planning period.

5. REMAINING USEFUL LIFE

The CCM presents an equipment life of 30 years for SCR. This value is conservatively used as the remaining useful life (RUL) in this analysis for Berlin 5 A Engine, Berlin 5 B Engine, and Gorge 16 SCCTs even though it is unrealistic to expect these units to operate for another 30 years. The units are currently 48, 48, and 56 years old, respectively.

6. ENERGY AND NON-AIR QUALITY ENVIRONMENTAL IMPACTS

The environmental impacts of SCR are well known and are primarily related to (a) the shipment and storage of ammonia or urea and (b) the potential for ammonia air emissions ("ammonia slip") – which would directly contribute to the formation of visibility affecting pollutants (ammonium sulfates and ammonium nitrates) – if the SCR is not operated within the ideal temperature window. Additionally, the SCR option would create a new solid waste (spent catalyst) that would have to be managed.

No significant adverse environmental impacts are associated with the combustion controls.

All energy impacts can be quantified in the cost assessment.

7. COSTS OF IMPLEMENTATION

The estimated cost of implementing Water Injection is based on information presented in the NESCAUM Report, at III-20, for a retrofit project planned by PSE&G of New Jersey. The project consisted of retrofitting 24 gas- and distillate oil-fired 21-MW peaking turbines, which, for the purposes of this analysis, reasonably represent Berlin 5 A Engine, Berlin 5 B Engine, and Gorge 16. The capital cost for the project is reported to be $9 million, or $375,000 per turbine, and the annual operations and maintenance (O&M) cost is estimated based on water usage and cost values of 10 gallons per minute (gpm) and $0.025/gallon. These costs represent an emissions reduction from 180 ppm to 50 ppm. For the purposes of this report, the costs are assumed to represent both emissions levels being evaluated for Water Injection. Based on the total hours of operation in 2019 for Berlin 5 A Engine, Berlin 5 B Engine, and Gorge 16 – 10.9, 11.4, and 28.9 hours/yr, respectively – the annual O&M cost estimate is $164/yr, $171/yr, and $434/yr, respectively.

The NESCAUM Report does not specify year-basis for the cost values so it is assumed that all the values are based the date of the report: 2000. Per the November 16, 2020 Request, the cost values are escalated to a 2019 basis (2019$) using the Chemical Engineering Plant Cost Index (CEPCI) values: 394.1 for 2000 and 607.5 for 2019. The result is a capital cost estimate of $582,045 per SCCT and annual O&M cost estimates of $254/yr for Berlin 5 A Engine, $265/yr for Berlin 5 B Engine, and $673/yr for Gorge 16.

The estimated cost of implementing SCR is based on information presented in EPA's *Air Pollution Control Technology Fact Sheet* for SCR, which gives a capital cost estimate of $5,000/MMBtu (minimum of range) and an annual O&M cost of $8,500/MMBtu/yr. The fact sheet values are on a 1999$ basis. Based on the total heat input in 2019 for Berlin 5 A Engine, Berlin 5 B Engine, and Gorge 16 - 2,874 MMBtu/yr, 2,190 MMBtu/yr, and 2,977 MMBtu/yr, respectively – the capital costs are estimated to be $14,370,000, $10,949,500, and $14,884,800, respectively, and the annual O&M costs are estimated to be $24,429,000/yr, $18,614,150/yr, and $25,304,160/yr, respectively. The 1999$ fact sheet values are escalated to 2019$ using the CEPCI values: 390.6 for 1999 and 607.5 for 2019). The result is capital cost estimates of $22,349,654, $17,029,752, and $23,150,323, respectively, and annual O&M costs estimates of $37,994,412/yr, $28,950,579/yr, and $39,355,548/yr, respectively.

The costs for Water Injection + SCR are estimated as the sum of the costs for each individual control option. Table 7-1 summarizes the estimated costs of implementation, including total and annualized capital costs[12], annual O&M costs, and total annual costs, and it presents the cost effectiveness values ($/ton based on emission reductions from Table 3-3) for each of the NO_X emission reduction options. It should be noted that actual costs of all the control options under evaluation can be known only after a two-month, unit-specific controls investigation. GMP reserves the right to conduct such an investigation and update this report if VDEC needs additional information or decides to require the installation of controls on any of the units.

[12] Annual capital costs are calculated in accordance with the CCM based on capital recovery over the 30-year RUL at an interest rate of 7 percent, which is the social rate of interest used by the EPA Office of Management and Budget (OMB) (see OMB Circular A-94).

Table 7-1. Estimated Costs (2019$) of NO_X Emission Reduction Options

Unit	NO_X Emission Reduction Option	Capital Costs ($)	Annualized Capital Costs ($/year)	Annual O&M Costs ($/year)	Total Annual Costs ($/year)	Cost Effectiveness ($/ton)
Berlin 5 A Engine	Water Injection + SCR	22,931,700	1,847,983	37,994,666	39,842,649	44,719,790
	Water Injection 0.05	582,045	46,905	254	47,159	56,582
	SCR	22,349,654	1,801,078	37,994,412	39,795,491	48,842,067
	Water Injection 0.11	582,045	46,905	254	47,159	63,111
Berlin 5 B Engine	Water Injection + SCR	17,611,798	1,419,271	28,950,844	30,370,116	43,338,331
	Water Injection 0.05	582,045	46,905	265	47,170	71,800
	SCR	17,029,752	1,372,366	28,950,579	30,322,945	47,339,234
	Water Injection 0.11	582,045	46,905	265	47,170	79,778
Gorge 16	Water Injection + SCR	23,732,368	1,912,506	39,356,221	41,268,727	31,868,294
	Water Injection 0.05	582,045	46,905	673	47,578	38,511
	SCR	23,150,323	1,865,601	39,355,548	41,221,150	34,966,480
	Water Injection 0.11	582,045	46,905	673	47,578	41,512

8. CONCLUSION

The smallest cost effectiveness value presented in Section 7 is more than $30,000/ton. This effectiveness value and all others are economically unreasonable, especially in consideration of the extremely small amount of emissions from Berlin 5 A Engine, Berlin 5 B Engine, and Gorge 16. No control requirements should be applied to these units for regional haze reasonable progress purposes.

APPENDIX A. RBLC QUERIES RESULTS

RBLC ID	Facility	Process	Fuel	Throughput		Controls	Emission Limit (ppm)	Emission Limit (lb/MMBtu)
AL-0069	INTERNATIONAL PAPER CO. RIVERDALE MILL	TURBINE, STATIONARY (OIL FIRED)	FUEL OIL	40	MW	LOW NOX BURNERS [STEAM INJECTION INTO THE TURBINES]	44	*0.05*
CA-0095	NORTHERN CALIFORNIA POWER AGENCY	TURBINE, 2, FUEL OIL	FUEL OIL	25.8	MW	H2O INJECTION	62	*0.07*
CA-0611	BANK OF AMERICA LOS ANGELES DATA CENTER	TURBINE, DIESEL & GENERATOR (SEE NOTES)	DIESEL FUEL	0		FUEL SPEC: LOW NOX DIESEL FUEL (SEE NOTES)	163	*0.18*
FL-0020	FLORIDA POWER	TURBINE PEAKING UNITS, 4 EA	FUEL OIL	63	MW	WATER INJECTION	No Data	No Data
FL-0045	CHARLES LARSEN POWER PLANT	TURBINE, OIL, 1 EACH	FUEL OIL	80	MW	WET INJECTION	42	*0.05*
FL-0054	LAKE COGEN LIMITED	TURBINE, OIL, 2 EACH	FUEL OIL	42	MW	COMBUSTION CONTROL	42	*0.05*
FL-0057	FLORIDA POWER AND LIGHT/DEBARY	TURBINE, OIL, 6 EACH	FUEL OIL	92.9	MW (EACH)	WET INJECTION	42	*0.05*
FL-0078	KISSIMMEE UTILITY AUTHORITY	TURBINE, FUEL OIL, UNIT 2	FUEL OIL	928	MMBTU/H	WATER INJECTION	42	*0.05*
FL-0092	GAINESVILLE REGIONAL UTILITIES	TURBINE, FUEL OIL	FUEL OIL	74	MW	WATER INJECTION	42	*0.05*
FL-0242	FPC - INTERCESSION CITY	TURBINE, SIMPLE CYCLE, FUEL OIL, (3)	FUEL OIL	87	MW	WET INJECTION	42	*0.05*
FL-0261	ARVAH B. HOPKINS GENERATING STATION	TURBINE, SIMPLE CYCLE (2) FUEL OIL	FUEL OIL	50	MW	WATER INJECTION SYSTEM, SCR	5	*0.01*
FL-0272	STOCK ISLAND POWER PLANT (KEYS ENERGY)	SIMPLE CYCLE COMBUSTION TURBINE	FUEL PIL	48	MW		42	*0.05*
GA-0024	SOUTHEAST PAPER CORP.	TURBINE, COMBUSTION	FUEL OIL	545	MMBTU/H	STEAM INJECTION	100	*0.11*
GA-0052	SAVANNAH ELECTRIC AND POWER CO.	TURBINES, 8	FUEL OIL	972	MMBTU/H, #2 OIL	MAX WATER INJECTION	42	*0.05*
GA-0079	GEORGIA POWER CO.- JACKSON COUNTY	TURBINE CT 1-16 (16 TURBINES)- FUEL OIL	FUEL OIL	978.3	MMBTU/H		42	*0.05*
GA-0099	SANDERSVILLE GENERATING STATION	TURBINE, SIMPLE CYCLE, FUEL OIL, (8)	FUEL OIL	80	MW	WATER INJECTION	10	*0.01*
GA-0108	SANDERSVILLE GENERATING STATION	TURBINE, SIMPLE CYCLE, FUEL OIL, (8)	FUEL OIL	80	MW	WATER INJECTION	42	*0.05*
HI-0006	HAWAII ELECTRIC LIGHT CO., INC.	TURBINE, OIL FIRED	FUEL OIL	18	MW	WATER INJECTION	42	*0.05*
HI-0013	MAUI ELECTRIC COMPANY, LTD.	TURBINE, FUEL OIL #2	FUEL OIL	28	MW	WATER INJECTION	42	*0.05*

RBLC ID	Facility	Process	Fuel	Throughput		Controls	Emission Limit (ppm)	Emission Limit (lb/MMBtu)
HI-0014	HAWAII ELECTRIC LIGHT CO., INC.	TURBINE, FUEL OIL #2	FUEL OIL	20	MW	COMBUSTOR WATER INJECTOR, WATER INJECTION	42	*0.05*
IL-0034	BABCOCK & WILCOX, LAUHOFF GRAIN	TURBINE	FUEL OIL	223	MMBTU/H	FUEL SPEC: FUEL/OPERATION	*492*	0.55
IN-0111	DUKE ENERGY VERMILLION STATION	TURBINE, SIMPLE CYCLE, DIESEL FUEL, (8)	DIESEL	80	MW	WET INJECTION	42	*0.05*
KS-0021	WESTERN RESOURCES' GORDON EVANS ENERGY CENTER	ELECTRIC GEN, TURBINE, FUEL OIL, E1CT &E2CT	FUEL OIL	838.9	MMBTU/H	DRY LOW NOX BURNERS AND WATER INJECTION.	42	*0.05*
MA-0015	PEABODY MUNICIPAL LIGHT PLANT	TURBINE, 38 MW OIL FIRED	DIESEL FUEL	412	MMBTU/H	WATER INJECTION	40	*0.04*
ME-0023	CENTRAL MAINE POWER CO. - CAPE STATION	COMBUSTION TURBINES (2)	#2 FUEL OIL	305.6	MMBTU/H	PROPER MAINTENANCE AND OPERATION, OPERATING LIMIT OF 500 H/YR FOR EACH TURBINE.	162	0.63
MN-0050	LAKEFIELD JUNCTION LP GENERATING STATION	TURBINES (6) - FUEL OIL	NO. 2 FUEL OIL	92	MW (EACH)	LOW NOX BURNERS, GOOD COMBUSTION PRACTICES	42	*0.05*
MO-0013	HIGGINSVILLE MUNICIPAL POWER FACILITY	ADD OF A DUAL FUEL FIRED TWIN-PAC TURBINE	#2 FUEL OIL	49.1	MW	CONTROLS TO REGULATE THE FUEL CONSUMPTION AND THE RATIO OF WATER TO FUEL BEING FIRED IN THE TURBINES	42	*0.05*
MS-0043	SOUTHAVEN ENERGY FACILITY	TURBINE, FUEL OIL	FUEL OIL	80	MW	USE OF LOW NOX COMBUSTORS. ALTERNATIVE EMISSION LIMIT IS 42 PPM ON 24 HOUR OPERATING PERIOD.	42	*0.05*
MS-0072	TVA - KEMPER COMBUSTION TURBINE PLANT	GENERAL ELECTRIC COMBUSTION TURBINES	NO.2 FUEL OIL				42	*0.05*
NC-0051	PANDA-ROSEMARY CORP.	TURBINE, COMBUSTION, #6 FRAME	FUEL OIL	499	MMBTU/H GAS	H2O INJECTION	*152*	0.17
NC-0087	DUKE ENERGY - BUCK COMBUSTION TURBINE FACILITY	TURBINE, SIMPLE CYCLE, FUEL OIL, (8)	NO. 2 FUEL OIL	80	MW	WATER INJECTION	42	0.176
NE-0012	OMAHA PUBLIC POWER DISTRICT	PEAKING TURBINES (4) FUEL OIL	#2 FUEL	25	MW	CLEAN FUEL, WATER INJECTION SYSTEM	42	*0.05*

RBLC ID	Facility	Process	Fuel	Throughput		Controls	Emission Limit (ppm)	Emission Limit (lb/MMBtu)
NJ-0009	NEWARK BAY COGENERATION PARTNERSHIP	TURBINE, KEROSENE FIRED	AVIATION FUEL	585	MMBTU/H	STEAM INJECTION AND SCR	16	0.063
NJ-0017	NEWARK BAY COGENERATION PARTNERSHIP, L.P.	TURBINES, COMBUSTION, KEROSENE-FIRED (2)	AVIATION KEROSENE	640	MMBTU/H (EACH)	SCR	16	0.06
NJ-0047	PRIME ENERGY	TURBINE (GAS)	NATURAL GAS, NO2 OIL	65	MEGAWATT	WATER INJECTION	27.2	0.1
NJ-0048	PRIME ENERGY	COMBUSTION TURBINE-DISTILLATE OIL	DISTILLATE OIL	715	MMBTU/H	WATER INJECTION	75	0.35
NJ-0054	(PCLP)	COMBUSTION TURBINE (2)	1-K KEROSENE	902.1	MMBTU/H	SCR, WATER INJECTION	9	0.043
NJ-0086	BAYONNNE ENERGY CENTER	Simple Cycle Stationary Turbines firing Ultra Low Sulfur Distillate Oil	Ultra Low Sulfur Distillate Oil	720	H/YR	SCR and water injection	5	*0.01*
NM-0048	CAMBRAY ENERGY CENTER	TURBINE, SIMPLE CYCLE, FUEL OIL, (2)	#2 FUEL OIL	80	MW	DLN BURNER AND GOOD COMBUSTION PRACTICES.	42	*0.05*
NV-0036	TS POWER PLANT	35 MW COMBUSTION TURBINES	#2 FUEL OIL	373.3	MMBTU/H	SCR & WATER INJECTION	6	*0.01*
NY-0062	FULTON COGEN PLANT	STACK EMISSIONS (TURBINE @DIST OIL & DUCT BURNER)	DIST OIL (TURBINE)	610	MMBTU/H	WATER INJECTION	61	*0.07*
NY-0064	INDECK-OSWEGO ENERGY CENTER	GAS TURBINE (DIST OIL)	DISTILATE OIL	533	MMBTU/H	STEAM INJECTION	65	*0.07*
NY-0065	KAMINE/BESICORP CARTHAGE L.P.	STACK (DIST OIL)	DISTILLATE OIL	540	LB/MMBTU	NO CONTROLS	65	0.25
NY-0066	INDECK SILVER-SPRING COGENERATION	GAS TURBINE (FUEL OIL) (EP #00001)	NO. 2 FUEL OIL	491	MMBTU/H	STEAM INJECTION	54	*0.06*
NY-0071	KAMINE SOUTH GLENS FALLS COGEN CO	GAS TURBINE (FUEL OIL)	FUEL OIL	498	MMBTU/H	WATER INJECTION	65	*0.07*
NY-0072	KAMINE/BESICORP SYRACUSE LP	GAS TURBINE (FUEL OIL)	FUEL OIL	650	MMBTU/H	WATER INJECTION	18	*0.02*
NY-0073	LOCKPORT COGEN FACILITY	(6) GE FRAME 6 TURBINES (FUEL OIL)	FUEL OIL	423.9	MMBTU/H	STEAM INJECTION	65	*0.07*
NY-0076	TRIGEN MITCHEL FIELD	GAS TURBINE (FUEL OIL)	FUEL OIL	424.7	MMBTU/H	STEAM INJECTION	65	*0.07*

RBLC ID	Facility	Process	Fuel	Throughput		Controls	Emission Limit (ppm)	Emission Limit (lb/MMBtu)
NY-0077	INDECK-YERKES ENERGY SERVICES	GAS TURBINE (FUEL OIL) (EP #00001)	FUEL OIL	432.2	MMBTU/H	STEAM INJECTION	65	*0.07*
NY-0081	LILCO SHOREHAM	(3) GE FRAME 7 TURBINES (EP #S 00007-9)	DIESEL FUEL	850	MMBTU/H	WATER INJECTION	55	*0.06*
OH-0291	OHIO EDISON CO.-WEST LORAIN PLANT	SIMPLE CYCLE COMBUSTION TURBINES (5) W/ DISTILLATE OIL	NATURAL GAS, FUEL OIL, KEROSENE	85	MW	WATER INJECTION INTO COMBUSTION ZONE	42	*0.05*
OH-0333	DAYTON POWER & LIGHT ENERGY LLC	Turbines (4), simple cycle, fuel oil #2	Fuel oil #2	4216	H/YR	Water injection	42	*0.05*
PA-0185	EXELON GEN./CROYDON., LLC	TURBINES, REGENERATIVE CYCLE (3)	#2 FUEL OIL	605	MMBTU/H	RACT CONTROL IS TO OPERATE AT A CAPACITY FACTOR NOT TO EXCEED 20 %	438	1.7
PA-0195	ALLEGHENY ENERGY SUPPLY GANS CT POWER STATION	TURBINE, SIMPLE CYCLE, FUEL OIL, (2)	FUEL OIL	44	MW	WATER INJECTION SYSTEM AND LOW SULFUR FUEL OIL	73.9	0.27
PA-0260	DELTA POWER PLANT	OIL FIRED TURBINES (6) (SIMPLE CYCLE)	OIL	11.24	T/H GAL/H		42	*0.05*
SC-0021	CAROLINA POWER AND LIGHT CO.	TURBINE, I.C., (3), FUEL OIL	NO.2 FUEL OIL	80	MW	WATER INJECTION	62	*0.07*
SC-0069	DUKE ENERGY MILL CREEK COMBUSTION TURBINE STATION	TURBINES, SIMPLE CYCLE, FUEL OIL, (8)	FUEL OIL	81.7	MW	DRY LOW NOX COMBUSTOR	42	*0.05*
TN-0148	TVA - GALLATIN FOSSIL PLANT	TURBINES, SIMPLE CYCLE, FUEL OIL, (4)	FUEL OIL	85	MW	WET INJECTION	42	*0.05*
VA-0189	GORDONSVILLE ENERGY L.P.	TURBINE FACILITY, FUEL OIL	FUEL OIL	74.4	MMGAL/YR	WATER INJECTION AND SCR	12	*0.01*
VA-0206	PATOWMACK POWER PARTNERS, LIMITED PARTNERSHIP	TURBINE, COMBUSTION, FUEL OIL (3)	FUEL OIL	18.2	MM GAL/YR	DRY LOW NOX COMBUSTOR DESIGN, WATER INJECTION	250	*0.28*
VA-0238	COMMONWEALTH CHESAPEAKE POWER STATION	TURBINES, SIMPLE CYCLE, OIL-FIRED (4), CT 4,5,6,7	DISTILLATE OIL	380	MMBTU/H	WATER INJECTION, NITROGEN LIMITS ON FUEL	42	*0.05*

RBLC ID	Facility	Process	Fuel	Throughput		Controls	Emission Limit (ppm)	Emission Limit (lb/MMBtu)
VA-0257	COMMONWEALTH CHESAPEAKE POWER STATION	ELECTRIC GENERATION	DISTILLATE OIL	380	MMBTU	USE OF WATER INJECTION.	42	*0.05*
VA-0263	ODEC - LOUISA FACILITY	TURBINE, SIMPLE CYCLE, (4), FUEL OIL	FUEL OIL #2	967	MMBTU/H	GOOD COMBUSTION PRACTICES AND A CONTINUOUS EMISSION MONITORING SYSTEM.	42	*0.05*
VA-0271	HARRISONBURG RESOURCE RECOVER FACILITY	TURBINE SHREDDER	DISTILLATE OIL	1.08	MMBTU/H	CURRENT DESIGN AND PROPER OPERATION AND MAINTENANCE. GOOD COMBUSTION PRACTICES.	1193	*1.33*
VA-0282	ODEC - LOUISA	TURBINE, SIMPLE CYCLE, FUEL OIL (4)	NO. 2 FUEL OIL	967	MMBTU/H	WATER INJECTION	42	*0.05*
VI-0006	KRUM BAY, ST. THOMAS	COMBUSTION TURBINE - UNIT 21	NO. 2 FUEL OIL	36	MW	WATER INJECTION. SEE POLLUTANT NOTES FOR ADDITIONAL LIMITS.	42	*0.05*
VI-0007	RICHMOND GENERATING STATION (SOUTH SHORE FACILITY)	COMBUSTION TURBINE - UNIT NO. 19	NO. 2 FUEL OIL	20	MW	WATER INJECTION; LIMIT BELOW EXCEPT WHEN OPERATING AT LOW LOADS	42	*0.05*
VI-0008	KRUM BAY ST. THOMAS GENERATING STATION	TURBINE UNIT NO. 22	NO. 2 FUEL OIL	24	MW	WATER INJECTION; NOTE: BACT ANALYSIS FOUND 4 GAS TURBINES WHERE SCR WAS BACT BUT IT WAS NOT REQUIRED HERE BECAUSE THEY WERE ALL COMBINED CYCLE UNITS (NOT SIMPLE) AND BURNED NATURAL GAS (NOT OIL).	42	*0.05*
VI-0009	ESTATE RICHMOND GENERATING STATION	COMBUSTION TURBINE - UNIT NO. 20	NO. 2 FUEL OIL	24.5	MW	WATER INJECTION	42	*0.05*
VI-0010	ST. CROIX CHRISTIANSTED GENERATING STATION	OIL FIRED TURBINE NO. 17	NO.2 FUEL OIL	20	MW	WATER INJECTION	42	*0.05*
VI-0012	VIWAPA - ST. THOMAS	TURBINE, SIMPLE CYCLE	NO. 2 DISTILLATE FUEL OIL	39	mw	STEAM/WATER INJECTION; LIMIT OF N2 TO 1000 PPM	84	*0.09*
VT-0008	VERMONT MARBLE COMPANY	TURBINES, SIMPLE CYCLE, FUEL OIL, (2)	FUEL OIL	50	MMBTU/H	WATER INJECTION	60	*0.07*

RBLC ID	Facility	Process	Fuel	Throughput		Controls	Emission Limit (ppm)	Emission Limit (lb/MMBtu)
WI-0128	NORTHERN STATE POWER CO. - WHEATON GEN. PLANT	SIMPLE CYCLE COMBUSTION TURBINE -6 TURBINES	#2 FUEL OIL	72	MW	STANDARD EMISSION LIMIT ESTIMATED USING PROCESS DATA	43	*0.05*

Note: *Italicized* emission limit values are calculated; they do not appear in the RBLC.