STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

DEPARTMENT ORDER

Rumford Power LLC **Oxford County** **Rumford, Maine** **A-724-77-1-A**	**Departmental** **Findings of Fact and Order** **New Source Review** **NSR #1**

FINDINGS OF FACT

After review of the air emission license amendment application, staff investigation reports, and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 Maine Revised Statutes (M.R.S.) § 344 and § 590, the Maine Department of Environmental Protection (the Department) finds the following facts:

I. REGISTRATION

A. Introduction

FACILITY	Rumford Power LLC
LICENSE TYPE	06-096 C.M.R. ch. 115, Minor Modification
NAICS CODES	221112
NATURE OF BUSINESS	Electric Power Generation
FACILITY LOCATION	43 Industrial Park Road, Rumford, Maine

B. NSR License Description

Rumford Power LLC (RP) has requested a New Source Review (NSR) license to perform a "Repair for Performance" upgrade to its Combustion Turbine. This project consists of both hardware and software upgrades and is described in more detail later in this license. Additionally, RP has requested an increase in the carbon monoxide (CO) emission limit that applies during periods of shutdown.

C. Emission Equipment

The following existing equipment is modified by this project:

Equipment	Maximum Heat Input Capacity (MMBtu/hr)	Max. Firing Rate (MMcf/hr)	Output Capacity (MW)	Fuel Type	Mfr. Date	Inst. Date
Combustion Turbine	1,975[1]	1.94[1]	197[2]	Natural Gas	1998	1999

D. Project Description

The Repair for Performance Project will allow for improved air flow through the turbine and reductions in air diverted through cooling passages. The project consists of both hardware and software upgrades that will increase turbine output and extend the life of the turbine and its components. The project will also allow the turbine to extend the use of its peak fire controls to allow for higher combustion temperatures so that the turbine can operate at a new higher peak load generation rate.

The Combustion Turbine is expected to achieve a 5-6 megawatt (MW) increase in output at peak load following the project. Peak load is currently estimated to be 191 MW, and following the project, it will increase to approximately 197 MW. The increase in electrical output will be accompanied by a 2-3 percent increase in heat input at peak load resulting in increased fuel consumption when the turbine is operating at the higher end of its operating curve. However, there is no need to increase the turbine's rated maximum heat input capacity as it is already conservatively high based on assumed constant operation at ambient temperatures below 15 °F.

E. Application Classification

All rules, regulations, or statutes referenced in this air emission license refer to the amended version in effect as of the issued date of this license.

The application for RP does not violate any applicable federal or state requirements and does not reduce monitoring, reporting, testing, or recordkeeping requirements. However, this application does seek to modify a Best Available Control Technology (BACT) analysis performed per New Source Review.

[1] The Combustion Turbine's rating for 1,975 MMBtu/hr is higher than the rating identified by the manufacturer due to increased fuel burning associated with minimum ambient air temperatures lower than what was expected by the manufacturer (< 15 °F).
[2] Following the Repair for Performance Project.

The modification of a major source is considered a major or minor modification based on whether or not expected emissions increases exceed the "Significant Emissions Increase" levels as given in *Definitions Regulation*, 06-096 Code of Maine Rules (C.M.R.) ch. 100. For a major stationary source, the expected emissions increase from each new, modified, or affected unit may be calculated as equal to the difference between the post-modification projected actual emissions and the baseline actual emissions for each NSR regulated pollutant.

1. Baseline Actual Emissions

   Baseline actual emissions (BAE) are equal to the average annual emissions from any consecutive 24-month period within the ten years prior to submittal of a complete license application. RP has proposed using calendar years 2015 and 2016 as the 24-month baseline period from which to determine baseline actual emissions for all pollutants for emission units affected as part of this project.

   BAE for the Combustion Turbine are consistent with emissions statements submitted to the Department in accordance with 06-096 C.M.R. ch. 137. Emissions of particulate matter were based on previous stack testing. Emissions of PM_{10} and $PM_{2.5}$ were based on filterable PM from previous stack testing plus condensable PM from AP-42, Table 3.1-2a. Emissions of SO_2 were based on the quantity of natural gas combusted and records of sulfur content from the supplier. Emissions of NO_x and CO were based on data from continuous emissions monitoring systems (CEMS). Emissions of VOC were based on standard emission factors.

   The results of this baseline analysis are presented in the table below.

Baseline Actual Emissions (1/2015 – 12/2016 Average)

Equipment	**PM (tpy)**	**PM_{10} (tpy)**	**$PM_{2.5}$ (tpy)**	**SO_2 (tpy)**	**NO_x (tpy)**	**CO (tpy)**	**VOC (tpy)**
Combustion Turbine	0.20	6.36	6.36	0.79	27.50	64.20	0.92

2. Projected Actual Emissions

   Projected actual emissions (PAE) are the maximum actual annual emissions anticipated to occur in any one of the five years (12-month periods) following the date existing units resume regular operation after the project or any one 12-month period in the ten years following if the project involves increasing the unit's design capacity or its potential to emit of a regulated pollutant.

   The Repair for Performance Project is expected to allow the turbine to operate at a higher peak load than is currently achievable resulting in a 2.5% higher heat input rate over current conditions. [Note, the current maximum licensed heat input rate of the turbine (1,975 MMBtu/hr) and corresponding fuel consumption rate will remain unchanged, as it is an over-estimate based on operating at low ambient air temperatures.]

Operation in future years was based on operation in the baseline years. The average annual heat input to the turbine (2,618,902 MMBtu/year) was conservatively increased by 3% to represent the potential increase in heat input following the project. This results in a projected actual heat input rate of 2,697,469 MMBtu/year.

PAE for PM, PM_{10}, $PM_{2.5}$, SO_2, and VOC were calculated as described in the baseline but using the projected actual heat input rate. To calculate PAE for NO_x and CO, emission factors were derived for calendar years 2015 and 2016 based on actual emissions of the pollutants for each year divided by the total heat input to the turbine in that year. The highest emission factor for each pollutant in either year (2015 or 2016) was applied to the projected actual heat input to estimate PAE.

The results of this projected actual emissions analysis are presented in the table below.

Projected Actual Emissions

Equipment	**PM (tpy)**	**PM_{10} (tpy)**	**$PM_{2.5}$ (tpy)**	**SO_2 (tpy)**	**NO_x (tpy)**	**CO (tpy)**	**VOC (tpy)**
Combustion Turbine	0.21	6.58	6.58	0.83	34.33	88.07	0.94

3. Emissions Increases

Emissions increases are calculated by subtracting BAE from the PAE. The emission increase is then compared to the significant emissions increase levels.

Emissions Increases

Pollutant	**Baseline Actual Emissions 2015 - 2016 (ton/year)**	**Projected Actual Emissions (ton/year)**	**Emissions Increase (ton/year)**	**Significant Emissions Increase Levels (ton/year)**
PM	0.20	0.21	+0.01	25
PM_{10}	6.36	6.58	+0.22	15
$PM_{2.5}$	6.36	6.58	+0.22	10
SO_2	0.79	0.83	+0.04	40
NO_x	27.50	34.33	+6.83	40
CO	64.20	88.07	+23.87	100
VOC	0.92	0.94	+0.02	40

4. Classification

Since emissions increases do not exceed significant emissions increase levels, this NSR license is determined to be a minor modification under *Minor and Major Source Air Emission License Regulations,* 06-096 C.M.R. ch. 115. RP has submitted an application to incorporate the requirements of this NSR license into the facility's Part 70 air emission license.

II. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license, the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in *Definitions Regulation*, 06-096 C.M.R. ch. 100. Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in 06-096 C.M.R. ch. 100. BACT is a top-down approach to selecting air emission controls considering economic, environmental, and energy impacts.

B. Combustion Turbine

The Combustion Turbine fires natural gas to generate electric power and heat that is used by the heat recovery steam generator (HRSG) to create steam to drive a steam turbine. Though the facility exhausts through the HRSG, the Combustion Turbine is the only fuel burning equipment in this process. Emissions from the Combustion Turbine are currently controlled by dry low-NO_x (DLN) combustion and a selective catalytic reduction (SCR) system.

1. BACT Findings

Although the licensed maximum heat input or fuel consumption for the Combustion Turbine will not change, the Repair for Performance Project involves physical changes to the emissions unit as well as changes to the method of operation. Therefore, the Combustion Turbine is a modified unit subject to BACT. Following is a summary of the BACT determination for the Combustion Turbine by pollutant.

a. Particulate Matter: $PM/PM_{10}/PM_{2.5}$

The principle components of particulate matter emissions from the Combustion Turbine include filterable and condensable particulate matter from incomplete combustion. Filterable and condensable particulate matter emitted from natural gas combustion is generally less than 2.5 microns in diameter. Natural gas tends to have typically low emissions of PM relative to other fossil fuels. Potential post-combustion control technologies for particulate matter include baghouses, electrostatic precipitators (ESP), wet scrubbers, and multicyclones.

<u>Baghouses</u>
Baghouses consist of a number of fabric bags placed in parallel that collect particulate matter on the surface of the filter bags as the exhaust stream passes through the fabric membrane. The collected particulate is periodically dislodged from the bags' surface to collection hoppers via short blasts of high-pressure air, physical agitation of the bags, or by reversing the gas flow. Baghouse systems are capable of PM filterable collection efficiencies greater than 98%, although the fine nature of the particulate matter emitted by natural gas combustion as well as the low pollutant loading would reduce this efficiency. A baghouse is a technically feasible option for control of PM from the Combustion Turbine.

<u>ESPs/WESPs</u>
ESPs work by charging particles in the exhaust stream with a high voltage, oppositely charging a collection surface where the particles accumulate, removing the collected dust by a rapping process, and collecting the dust in hoppers. In wet ESPs (WESPs), the collectors are either intermittently or continuously washed by a spray of liquid, usually water. Instead of collection hoppers, a drainage system is used. ESP/WESP systems are capable of PM filterable collection efficiencies up to 98%. An ESP/WESP is a technically feasible option for control of PM from the Combustion Turbine.

<u>Multicyclones</u>
Mechanical separators include cyclonic and inertial separators. In a multicyclone, centrifugal force separates larger PM from the gas stream. The exhaust gas enters a cylindrical chamber on a tangential path and is forced along the outside wall of the chamber at a high velocity, causing the PM to impact collectors on the outer wall of the unit and fall into a hopper for collection. Multicyclones have typical removal efficiencies of 40 – 90% for filterable PM_{10} and zero to 40% for filterable $PM_{2.5}$. The use of multicyclones is considered a technically feasible option for the control of PM emissions from the Combustion Turbine.

<u>Wet Scrubbers</u>
Wet scrubbers remove PM from gas streams primarily through impaction and, to a lesser extent, other mechanisms such as interception and diffusion. A scrubbing

liquid (typically water) is sprayed countercurrent to the exhaust gas stream. Contact between the larger scrubbing liquid droplets and the suspended particulates removes the PM from the gas stream. Entrained liquid droplets then pass through a mist eliminator (coalescing filter) which causes the droplets to become heavier and fall out of the exhaust stream. Wet scrubbers typically have removal efficiencies of 90 – 99% for emissions of PM_{10} and significantly lower efficiencies for $PM_{2.5}$ (as low as 50% for spray tower scrubbers). High-efficiency scrubbers such as venturi scrubbers can be used to achieve greater removal efficiencies for $PM_{2.5}$ of greater than 99% due to the high velocities and pressure drops at which they operate. A wet scrubber is a technically feasible option for control of PM from the Combustion Turbine.

<u>BACT Determination for Particulate Matter</u>
A search of EPA's RACT/BACT/LAER Clearinghouse (RBLC) did not identify any post-combustion control technologies for particulate matter in use on natural gas-fired turbines similar to the Combustion Turbine. Although each of the control options listed above is technically feasible, uncontrolled emissions of particulate matter from the Combustion Turbine are relatively small. In many cases, the low pollutant loading results in reduced control efficiency especially since most of the technologies listed above would have little to no effect on condensable particulate matter. Additionally, each of the technologies listed above would introduce backpressure into the Combustion Turbine that would significantly reduce its efficiency. Therefore, due to this tradeoff and the relatively low pollutant loading, the use of post-combustion control technologies for the control of particulate matter emissions from the Combustion Turbine is determined to not be economically feasible.

The Department finds the firing of natural gas and the following emission limits to represent BACT for particulate matter emissions from the Combustion Turbine:

Units	PM	PM_{10}	$PM_{2.5}$
lb/MMBtu	0.007	–	–
lb/hr	13.8	23.7	23.7

These standards apply at all times. Compliance with the particulate matter limits shall be demonstrated through performance testing upon request by the Department.

Visible emissions from the Combustion Turbine shall not exceed 20% opacity on a six-minute block average basis except for periods of startup during which time RP may comply with the following work practice standards in lieu of the numerical visible emissions limit:

(1) Maintain a log (written or electronic) of the date, time, and duration of all startups of the Combustion Turbine or its associated air pollution control equipment which result in RP electing to comply with this section.

(2) Develop and implement a written startup and shutdown plan.

(3) Limit the duration of startups to not exceed 300 minutes per occurrence, as defined in RP's license.

(4) Operate the Combustion Turbine, including any associated air pollution control equipment, at all times in a manner consistent with safety and good air pollution control practices for minimizing emissions. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Department that may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the unit.

b. Sulfur Dioxide: SO_2

Emissions of SO_2 from the Combustion Turbine are attributable to the oxidation of sulfur compounds contained in the fuel. Potential pollution control options to reduce SO_2 emissions include flue gas desulfurization by means of wet scrubbing and firing fuels with an inherently low sulfur content, such as natural gas.

<u>Flue Gas Desulfurization</u>
Flue gas desulfurization by means of wet scrubbing works by injecting a caustic solution into the scrubber unit to react with the SO_2 in the flue gas to form a precipitate and either carbon dioxide or water. Flue gas desulfurization by means of wet scrubbing can have control efficiencies upwards of 90%. However, operation of a wet scrubber is very energy intensive due to the pressure differential created. Additionally, use of a wet scrubber would introduce backpressure into the Combustion Turbine that would significantly reduce its efficiency. Therefore, based on the low pollutant loading and the technological challenges involved, the use of a wet scrubber for flue gas desulfurization is determined to not be economically feasible.

BACT Determination for SO_2

A search of the RBLC did not identify any SO_2 control technologies in use on natural gas-fired turbines similar to the Combustion Turbine. The Department finds the use of natural gas, which inherently has a low sulfur content, and an emission limit of 10.8 lb/hr represent BACT for SO_2 emissions from the Combustion Turbine. This standard applies at all times.

Compliance with the SO_2 limit is based on monthly recordkeeping of the amount of natural gas fired in the Combustion Turbine and the most recent tariff sheet showing the sulfur content of the natural gas fired.

c. Nitrogen Oxides: NO_x

NO_x from combustion is generated through one of three mechanisms: fuel NO_x, thermal NO_x, and prompt NO_x. Fuel NO_x is produced by the oxidation of nitrogen in the fuel source, with low nitrogen content fuels such as natural gas producing less NO_x than fuels with higher levels of fuel-bound nitrogen. Thermal NO_x forms in the high temperature area of the combustor and increases exponentially with increases in flame temperature and linearly with increases in residence time. Flame temperature is dependent upon the ratio of fuel burned in a flame to the amount of fuel needed to consume all the available oxygen, also known as the equivalence ratio. The lower this ratio is, the lower the flame temperature; thus, by maintaining a low fuel ratio (lean combustion), the potential for NO_x formation can be reduced. Prompt NO_x forms from the oxidation of hydrocarbon radicals near the combustion flame and produces an insignificant amount of NO_x in combustion turbines.

Potential control technologies for combustion turbines include add-on controls, such as selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), and EMx™, the use of combustion control techniques such as Dry low-NO_x (DLN) combustion and water/steam injection, and the combustion of clean fuel such as natural gas.

SCR

SCR employs the reaction of NO_x with ammonia (NH_3) or urea in the presence of a catalyst to produce nitrogen and water. The reduction is considered “selective” because the catalyst selectively targets NO_x reduction in the presence of ammonia within a temperature range of approximately 480 ºF to 800 ºF, according to the following reactions:

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$$
$$2NO_2 + 4NH_3 + O_2 \rightarrow 3N_2 + 6H_2O$$

SCR systems have typical control efficiencies between 70 – 90%. RP currently employs the use of SCR to control NO_x from the Combustion Turbine.

SNCR

SNCR is a method of post combustion control that selectively reduces NO_x into nitrogen and water vapor by reacting the exhaust gas with a reagent such as ammonia or urea, similar to SCR. However, in SNCR, a catalyst is not used to lower the activation temperature of the NO_x reduction reaction. Therefore, SNCR is used when flue gas temperatures are between 1600 ºF and 2100 ºF.

The reagent solution (either ammonia or urea) is typically injected along the post-combustion section of the emissions unit. Injection sites must be optimized for reagent effectiveness and must balance residence time with flue gas stream temperature. The potential for unreacted ammonia emissions (ammonia slip) is greater with SNCR than with SCR, and the overall NO_x reduction is less. SNCR systems have typical control efficiencies between 30 – 75%.

The NO_x reduction efficiency decreases rapidly at temperatures outside the optimum temperature window which results in excessive unreacted ammonia slip and increased NO_x emissions. This temperature window is higher than the exhaust gas temperature from the Combustion Turbine and HRSG and would require additional burners to raise the exhaust to the required temperature range. However, SNCR is technically feasible.

EMx™

EMx™ (formerly called SCONOX™) is a post-combustion catalytic NO_x reduction technology. EMx™ uses a precious metal catalyst and a NO_x absorption/regeneration process to convert CO and NO_x to CO_2, water, and elemental nitrogen. NO_x in the exhaust stream reacts with a potassium carbonate absorbent coating the surface of the oxidation catalyst in the EMx™ reactor forming potassium nitrites and nitrates that are deposited onto the catalyst surface. Each "can" within the reactor becomes saturated with potassium nitrites and nitrates over time and must be desorbed. Regeneration is accomplished by isolating the can and injecting hydrogen diluted with steam. The hydrogen is generated on-site with a small reformer that uses natural gas and steam as input streams. Hydrogen and carbon dioxide react with the potassium nitrites and nitrates to form elemental nitrogen and water and to regenerate the potassium carbonate for another absorption cycle.

EMx™ is a complicated technology which has not been installed or demonstrated on a turbine greater than 45 MW. Additionally, it has not been demonstrated to reduce emissions of NO_x below those that can be achieved with SCR. Therefore, EMx™ is not considered technically feasible for the Combustion Turbine.

Water/Steam Injections

Water/steam injection is the process of injecting water or steam into the combustion chamber to cool the combustion process and lower the peak flame temperature, thus reducing thermal NO_x. It is a highly effective control technique, reducing NO_x emissions by up to 50%. Water/steam injection is considered technically feasible.

DLN Combustion

DLN combustion reduces emissions of NO_x without injection of water or steam, hence the term "dry." DLN combustors are designed to control peak combustion temperature, combustion zone residence time, and combustion zone free oxygen, thereby minimizing thermal NO_x formation. This is accomplished by producing a lean, pre-mixed flame that burns at a lower flame temperature and excess oxygen levels than conventional combustors. RP currently employs the use of DLN combustion to control NO_x from the Combustion Turbine.

BACT Determination for NO_x

Use of an SNCR system would involve installing burners to raise the exhaust temperature would be less efficient and result in higher emissions of other combustion pollutants than use of the existing SCR system. Use of a water/steam injection system would be less efficient than the current control strategy. Therefore, the Department finds the use of SCR and DLN combustion for control of NO_x emissions and the following emission limits to represent BACT for NO_x emissions from the Combustion Turbine:

Units	NO_x	NH_3
ppmdv @ 15% O_2 (24-hour block average)	3.5	10
lb/hr[3]	25.5	27.0

The NO_x standards apply at all times except for periods of startup and shutdown[4]. The NH_3 standards apply at all times. Compliance with the NO_x ppmdv emission limit shall be demonstrated by operation of a NO_x CEMS. Compliance with the NH_3 ppmdv emission limit shall be demonstrated by operation of a NH_3 CEMS. Compliance with the NO_x and NH_3 lb/hr emission limits shall be demonstrated through performance testing upon request by the Department.

[3] The mass-based emission limit is higher than the previously licensed limit (25.3 lb/hr) due to a correction in the calculation used to convert from the rate-based (ppmdv) limit and does not represent an actual increase in emissions.

[4] Emissions during periods of startup and shutdown are addressed later in this license.

d. Carbon Monoxide and Volatile Organic Compounds: CO & VOC

CO and VOC emissions are attributable to the incomplete combustion of organic compounds in the fuel. Emissions result when there is insufficient residence time or when there is insufficient oxygen available near the hydrocarbon molecule during combustion to complete the final step in oxidation. Combustion modifications taken to reduce CO emissions may result in increased emissions of NO_x. Pollution control options to reduce CO and VOC emissions include add-on technologies such as an oxidation catalyst as well as combustion controls.

<u>Oxidation Catalyst</u>
An oxidation catalyst is a post-combustion control technology that removes CO from the exhaust stream. In the presence of a catalyst, CO will react with oxygen present in the exhaust stream converting it to carbon dioxide. No supplementary reactant is used in conjunction with an oxidation catalyst. Catalysts are typically based on a noble metal and operate by decreasing the temperature at which oxidation of CO will occur. The catalyst lowers the activation energy necessary for CO to react with available oxygen.

The Combustion Turbine is currently subject to a CO emission limit of 15 ppmdv @ 15% O_2 on a 24-hour block average. Retrofitting this emission unit with an oxidation catalyst could result in reductions of CO emissions. However, oxidation catalysts work best when they are included in the original plant design and construction. Retrofitting the existing Combustion Turbine is cost prohibitive. The only likely place it could be physically located is on the HRSG outlet which would require removing and reinstalling the stack and SCR catalyst. Therefore, use of an oxidation catalyst is not considered to be economically feasible.

<u>BACT Determination for CO and VOC</u>
The Department finds the use of combustion controls which limit emissions to the following levels to represent BACT for CO and VOC emissions from the Combustion Turbine.

Units	CO	VOC
ppmdv @ 15% O_2 (24-hour block average)	15	N/A
lb/hr[5]	66.5	3.1

The CO standards apply at all times except for periods of startup and shutdown[6]. The VOC standard applies at all times. Compliance with the CO ppmdv emission

[5] The mass-based emission limit of CO is higher than the previously licensed limit (53.9 lb/hr) due to a correction in the calculation used to convert from the rate-based (ppmdv) limit and does not represent an actual increase in emissions.
[6] Emissions during periods of startup and shutdown are addressed later in this license.

limit shall be demonstrated by operation of a CO CEMS. Compliance with the CO and VOC lb/hr emission limits shall be demonstrated through performance testing upon request by the Department.

e. Startup/Shutdown Emissions

Emission limits of NO_x and CO apply at all times except for periods of startup and shutdown. Currently the Combustion Turbine is limited to the following emissions for NO_x and CO during startup and shutdown.

Pollutant	Performance Standard	Averaging Period	Origin and Authority
NO_x	90 ppmdv @ 15% O_2	Duration of Startup / Shutdown	A-724-70-A-A/I (08/15/2003), BPT
CO	1,000 ppmdv @ 15% O_2	Duration of Startup	A-724-70-A-A/I (08/15/2003), BPT

RP is allowed up to 300 minutes for startup and 60 minutes for shutdown. Current operating procedures do not typically require this length of time for shutdown. However, RP sometimes extends the shutdown period to take advantage of the extra averaging time allowed in order to demonstrate compliance. RP has requested an increase in the CO emission limit to 1,500 ppmdv @ 15% O_2 with a corresponding decrease in the time of the shutdown event. This will allow the Combustion Turbine to shut down more quickly while not resulting in an increase in the mass emissions of either pollutant since most shutdown events can be accomplished in 40 minutes or less.

The Department agrees with this request and finds the following to represent BACT for emissions of CO during periods of shutdown.

Pollutant	Performance Standard	Averaging Period	Origin and Authority
CO	1,500 ppmdv @ 15% O_2	Duration of Shutdown	06-096 C.M.R. ch. 115, BACT

For the purposes of this license, *startup* is defined as a period which begins when any fuel is fired in the Combustion Turbine after a shutdown and ends when the unit reaches steady state operation. Steady state operation is reached when the Combustion Turbine reaches 50% base load and the steam turbine is declared available for load changes. Aborted startups shall be included in this definition. Startup shall be completed as soon as practicable, but in no case shall this period exceed 300 minutes. RP shall maintain records of all startup times and durations. Records of startups lasting longer than 240 minutes shall include an explanation of the circumstances that led to the longer startup period.

For the purposes of this license, *shutdown* is defined as a period which begins when steady state operation stops and ends with cessation of Combustion Turbine firing. Shutdown shall be completed as soon as practicable, but in no case shall this period exceed 60 minutes. RP shall maintain records of all shutdown times and durations. Records of shutdowns lasting longer than 40 minutes shall include an explanation of the circumstances that led to the longer shutdown period.

2. New Source Performance Standards

The Repair for Performance Project is considered a "modification" of the Combustion Turbine per *Standards of Performance for New Stationary Sources*, 40 C.F.R. Part 60, Subpart A § 60.2.

The Combustion Turbine is not subject to *Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units*, 40 C.F.R. Part 60, Subpart TTTT. This regulation is applicable to new and reconstructed steam generating units (i.e., boilers/furnaces), integrated gasification combined cycle (IGCC) units (i.e., units that burn ≥ 50% solid-derived fuel), and combustion turbines. It is also applicable to modified steam generating units and IGCC units but not modified combustion turbines. RP's Combustion Turbine will be a modified unit which is not new or reconstructed.

The Combustion Turbine is currently subject to *Standards of Performance for Stationary Gas Turbines*, 40 C.F.R. Part 60, Subpart GG. The requirements of Subpart GG are addressed in RP's current Part 70 license.

The Repair for Performance Project will make the Combustion Turbine a modified unit subject to *Standards of Performance for Stationary Combustion Turbines*, 40 C.F.R. Part 60, Subpart KKKK. The Combustion Turbine will become subject to Subpart KKKK upon startup following commencing construction on the Repair for Performance Project. RP will be considered to have commenced construction as soon as the facility makes any hardware or software change as part of the project.

Per 40 C.F.R. § 60.4305(b), stationary combustion turbines regulated under Subpart KKKK are exempt from the requirements of 40 C.F.R. Part 60, Subpart GG. The Combustion Turbine will remain subject to Subpart GG until becoming subject to Subpart KKKK, i.e., until the first startup following commencing construction on the Repair for Performance Project.

The requirements of Subpart KKKK shall be addressed in RP's Part 70 license at the time this NSR license is incorporated.

3. National Emission Standards for Hazardous Air Pollutants

The Combustion Turbine is not subject to *National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines*, 40 C.F.R. Part 63, Subpart YYYY. This regulation applies to stationary combustion turbines located at a major source of hazardous air pollutants (HAP). RP is not licensed as a major source of HAP.

C. Incorporation Into the Part 70 Air Emission License

Per *Part 70 Air Emission License Regulations*, 06-096 C.M.R. ch. 140 § 1(C)(8), for a modification at the facility that has undergone NSR requirements or been processed through 06-096 C.M.R. ch. 115, the source must apply for an amendment to their Part 70 license within one year of commencing the proposed operations, as provided in 40 C.F.R. Part 70.5. An application to incorporate the requirements of this NSR license into the Part 70 air emission license has been submitted to the Department.

D. Annual Emissions

The table below provides an estimate of facility-wide annual emissions for the purposes of calculating the facility's annual air license fee. Only licensed equipment is included, i.e., emissions from insignificant activities are excluded. Similarly, unquantifiable fugitive particulate matter emissions are not included. Maximum potential emissions were calculated based on the following assumptions:

- Operation of the Combustion Turbine and the Water Bath Heater for 8,760 hr/yr each; and
- Operation of the Fire Pump for 100 hrs/yr.

Please note, this information provides the basis for fee calculation only and should not be construed to represent a comprehensive list of license restrictions or permissions. That information is provided in the Order section of this license.

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

	PM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	VOC	NH_3
Combustion Turbine	60.6	103.8	103.8	47.3	111.6	291.2	13.6	118.0
Water Bath Heater	2.4	2.4	2.4	0.1	1.9	1.6	0.1	–
Fire Pump	–	–	–	–	0.3	0.1	–	–
Total TPY	**63.0**	**106.2**	**106.2**	**47.4**	**113.8**	**292.9**	**13.7**	**118.0**

Pollutant	Tons/year
Single HAP	9.9
Total HAP	24.9

III. AMBIENT AIR QUALITY ANALYSIS

RP previously submitted an ambient air quality impact analysis outlined in air emission license A-724-71-A-N (dated 5/7/1998) demonstrating that emissions from the facility, in conjunction with all other sources, do not violate ambient air quality standards (AAQS). An additional ambient air quality impact analysis is not required for this NSR license amendment.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards,
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants New Source Review License Amendment A-724-77-1-A pursuant to the preconstruction licensing requirements of 06-096 C.M.R. ch. 115 and subject to the specific conditions below.

Severability. The invalidity or unenforceability of any provision of this License Amendment or part thereof shall not affect the remainder of the provision or any other provisions. This License Amendment shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

SPECIFIC CONDITIONS

Any portion of license requirements of the following Conditions from previously issued air emission licenses or amendments which might be considered issued through NSR are considered obsolete or replaced by the Conditions in this license:

- **Conditions (17) through (28) and Conditions (31) through (34) of Air Emission License A-724-71-A-N.**
- **Condition (2) of Air Emission License A-724-71-C-M.**
- **Conditions (15) through (20), (25), (26), and (29) through (31) of Air Emission License A-724-70-A-A/I.**
- **Conditions (15) through (20), (25), (26), and (29) through (31) of Air Emission License A-724-70-D-R/A.**

(1) **Combustion Turbine**

A. The Combustion Turbine shall fire only natural gas. [06-096 C.M.R. ch. 115, BACT]

B. Control Equipment

1. RP shall operate and maintain a selective catalytic reduction (SCR) system on the Combustion Turbine for control of NO_x during all times the Combustion Turbine is operating except for periods of startup and shutdown. [06-096 C.M.R. ch. 115, BACT]

2. RP shall operate and maintain dry low-NO_x (DLN) combustors on the Combustion Turbine for control of NO_x during all times the Combustion Turbine is operating. [06-096 C.M.R. ch. 115, BACT]

3. The exhaust from the Combustion Turbine and HRSG shall be vented through a 150-foot above ground level stack. [06-096 C.M.R. ch. 115, BACT]

C. Emission Limits and Standards

Emission limits are on a 1-hour block average basis unless otherwise stated.

1. Emissions from the Combustion Turbine shall not exceed the following limits. These limits apply at all times, except for periods of startup and shutdown.

Pollutant	ppmdv	Origin and Authority
NO_x	3.5 @ 15% O_2 (24-hr block avg)	06-096 C.M.R. ch. 115, BACT
CO	15 @ 15% O_2 (24-hr block avg)	
NH_3	10 @ 15% O_2 (24-hr block avg)	

2. Emissions from the Combustion Turbine shall not exceed the following limit. This limit applies at all times.

Pollutant	lb/MMBtu	Origin and Authority
PM	0.007	06-096 C.M.R. ch. 115, BACT

3. Emissions from the Combustion Turbine shall not exceed the following limits. These limits apply at all times unless otherwise noted.

Pollutant	lb/hr	Origin and Authority
PM	13.8	06-096 C.M.R. ch. 115, BACT
PM_{10}	23.7	
$PM_{2.5}$	23.7	
SO_2	10.8	
NO_x (See Note 1)	25.5	
CO (See Note 1)	66.5	
VOC	3.1	
NH_3	27.0	

Note 1: Applies at all operating times except during periods of startup and shutdown.

4. Visible emissions from the Combustion Turbine shall not exceed 20% opacity on a six-minute block average basis except for periods of startup during which time RP may comply with the following work practice standards in lieu of the numerical visible emissions limit:

   a. Maintain a log (written or electronic) of the date, time, and duration of all startups of the Combustion Turbine or its associated air pollution control equipment which result in RP electing to comply with this section.

   b. Develop and implement a written startup and shutdown plan.

   c. Limit the duration of startups to not exceed 300 minutes per occurrence, as defined in RP's license.

   d. Operate the Combustion Turbine, including any associated air pollution control equipment, at all times in a manner consistent with safety and good air pollution control practices for minimizing emissions. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Department that may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the unit.

   [06-096 C.M.R. ch. 101, § 3(A)(4)]

D. Startup/Shutdown
[06-096 C.M.R. ch. 115, BACT]

1. RP shall minimize emissions from the Combustion Turbine to the maximum extent practicable during startup and shutdown and under maintenance or adjustment conditions by following proper operating procedures to minimize the emissions of air contaminants to the maximum extent practical.

2. Emissions from the Combustion Turbine during periods of startup shall not exceed the following:

Pollutant	Performance Standard	Averaging Period	Origin and Authority
NO_x	90 ppmdv @ 15% O_2	Duration of Startup	06-096 C.M.R. ch. 115, BACT
CO	1,000 ppmdv @ 15% O_2	Duration of Startup	06-096 C.M.R. ch. 115, BACT

3. *Startup* shall be defined as a period which begins when any fuel is fired in the Combustion Turbine after a shutdown and ends when the unit reaches steady state operation. Steady state operation is reached when the Combustion Turbine reaches 50% base load and the steam turbine is declared available for load changes. Aborted startups shall be included in this definition.

   Startup shall be completed as soon as practicable, but in no case shall this period exceed 300 minutes. RP shall maintain records of all startup times and durations. Records of startups lasting longer than 240 minutes shall include an explanation of the circumstances that led to the longer startup period.

4. Emissions from the Combustion Turbine during periods of shutdown shall not exceed the following:

Pollutant	Performance Standard	Averaging Period	Origin and Authority
NO_x	90 ppmdv @ 15% O_2	Duration of Shutdown	06-096 C.M.R. ch. 115, BACT
CO	1,500 ppmdv @ 15% O_2	Duration of Shutdown	06-096 C.M.R. ch. 115, BACT

5. *Shutdown* is defined as a period which begins when steady state operation stops and ends with cessation of Combustion Turbine firing. Shutdown shall be completed as soon as practicable, but in no case shall this period exceed 60 minutes. RP shall maintain records of all shutdown times and durations. Records of shutdowns lasting

longer than 40 minutes shall include an explanation of the circumstances that led to the longer shutdown period.

E. Compliance Demonstration
[06-096 C.M.R. ch. 115, BACT]

1. Compliance with the SO_2 lb/hr limit is based on monthly recordkeeping of the hours of operation, the amount of natural gas fired in the Combustion Turbine, and records of the fuel sulfur content (e.g., the most recent tariff sheet showing the sulfur content of the natural gas fired).

2. CEMS

   a. Compliance with the NO_x, CO, and NH_3 ppmdv emission limits shall be demonstrated through use of a Continuous Emission Monitoring System (CEMS) which meet the performance specifications of 40 C.F.R. Part 60, Appendix B and F, 40 C.F.R. Part 75, Appendix A and B, and 06-096 C.M.R. ch. 117 as applicable.

   b. A 24-hour block average basis shall be calculated as the arithmetic average of not more than 24 and not less than 8 one (1) hour block average periods. Only one 24-hour block average shall be calculated for each day, beginning at midnight. RP shall include all hours that the Combustion Turbine is operating during each day in each 24-hour block average with the exception of any hours which include periods of startup or shutdown. Any hour that includes any time considered part of a period of startup or shutdown shall not be included in the 24-hour block average.

3. Upon request by the Department, compliance with the visible emission limits shall be demonstrated through performance testing in accordance with 40 C.F.R. Part 60, Appendix A, Method 9.

4. Upon request by the Department, compliance with all other emission limits shall be demonstrated through performance testing in accordance with an appropriate test method as approved by the Department.

5. RP shall record data and maintain records for the following periodic monitoring values for the Combustion Turbine and its associated air pollution control equipment whenever the equipment is operating.

Parameter Monitored	Monitor Method	Monitoring Frequency	Record Frequency
Turbine natural gas firing rate	Flow meter	Continuously	Once per hour
Electric load level	Electronic monitor	Continuously	Once per shift
Turbine air inlet temperature	Temperature probe	Continuously	Once per shift
Catalyst bed temperature	Temperature probe	Continuously	Once per shift

F. New Source Performance Standards

The Combustion Turbine shall continue to be subject to, and comply with all applicable requirements of, *Standards of Performance for Stationary Combustion Turbines*, 40 C.F.R. Part 60, Subpart GG until becoming subject to 40 C.F.R. Part 60, Subpart KKKK.

Upon startup following the commencement of construction on the Repair for Performance project, the Combustion Turbine shall be considered a modified unit subject to *Standards of Performance for Stationary Combustion Turbines*, 40 C.F.R. Part 60, Subpart KKKK, and RP shall comply with all applicable requirements of this regulation. Per 40 C.F.R. § 60.4305(b), the Combustion Turbine will cease being subject to 40 C.F.R. Part 60, Subpart GG at this point.

DONE AND DATED IN AUGUSTA, MAINE THIS 7th DAY OF MAY, 2020.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY:______________________________ for _____
GERALD D. REID, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: 3/2/2020
Date of application acceptance: 3/2/2020

Date filed with the Board of Environmental Protection:

This Order prepared by Lynn Muzzey, Bureau of Air Quality.

FILED

MAY 7, 2020

State of Maine
Board of Environmental Protection