

5. OVERVIEW OF POTENTIAL EMISSIONS

This section of the application describes the emission calculation methodologies that were used to estimate the hourly and annual potential to emit (PTE) for NO_x, CO, SO₂, VOC, PM, PM₁₀, PM_{2.5}, lead (Pb), sulfuric acid mist (H₂SO₄), and HAPs for the proposed emission sources associated with the Princeton Road Station (PRS). Detailed calculations for all sources at PRS can be found in Appendix C. The proposed emission sources include:

- ▶ Twelve (12) 18 MW Wartsila RICE, operating utilizing either natural gas or fuel oil
- ▶ Four (4), 260 MW Siemens Combustion Turbines, operating utilizing either natural gas or fuel oil, with two operating scenarios:
 - All four (4) CTs operating in simple cycle
 - Three (3) of the four (4) CTs operating in a 3x1 combined cycle configuration and the fourth CT operating in simple cycle
- ▶ Two (2) natural gas-fired Dew Point Heaters to support the RICE
- ▶ Four (4) natural gas-fired Dew Point Heaters to support the CTs
- ▶ One (1) natural gas-fired Auxiliary Boiler
- ▶ Four (4) diesel-fired Emergency Generators
- ▶ One (1) diesel-fired Fire Pump Engine
- ▶ Diesel Fuel Storage Tanks
 - Four (4), 2,000,000-gallon tanks
- ▶ Natural Gas-Fired Space Heaters

The table below summarizes the site-wide PTE for PRS. A summary of the site-wide PTE can also be found in Appendix C and the required application forms in Appendix A.

Table 5-1. Site Wide PTE for PRS

Pollutant	Princeton Road Station PTE (tpy)
CO	19,055
NO _x	3,109
PM	841
PM ₁₀	841
PM _{2.5}	841
SO ₂	105
VOC	2,050
H ₂ SO ₄	44
Pb	0.5
GHGs as CO ₂ e	7,700,681

5.1 Wartsila RICE Potential Emissions

The twelve (12), 18 MW 18V50DF Wartsila RICE will be capable of firing either natural gas (in dual fuel mode) or diesel (in diesel mode), and they will emit NO_x, CO, SO₂, VOC, PM, PM₁₀, PM_{2.5}, H₂SO₄, and HAPs once installed. The calculations take into consideration that the RICE will be equipped with an SCR system for the control of NO_x and an oxidation catalyst for the control of CO and VOC. Both air pollution control systems are catalytic systems that require a specific temperature range to fully function. The incorporation of the effect of the catalysts warrants careful consideration when estimating the potential emissions of NO_x, CO, and VOC.

Steady state emissions are based on the proposed BACT described in Section 4, which is derived from vendor-provided pound per hour emissions data, sulfur content of the fuel, or published emission factors. Wartsila provided emissions data for the RICE that cover a range of steady state operating loads (40%, 50%, 75%, and 100%). For each load, Wartsila included the maximum outlet exhaust concentration and the maximum hourly emission rates for NO_x, CO, VOC, and total particulates.

Table 5-2 shows the Wartsila steady state data from 40% to 100% load.

Table 5-2. Vendor-Provided Steady State Emissions – RICE

Load Case	Maximum Capacity (kW)	Vendor-Provided Hourly Emissions			
		NO _x (lb/hr)	CO (lb/hr)	VOC (lb/hr)	PM (lb/hr)
100% - NG	18,000	3.20	4.90	4.90	3.90
75% - NG	13,500	2.50	4.00	3.90	3.20
50% - NG	9,000	2.60	2.70	3.90	3.00
40% - NG	7,200	2.20	2.30	4.20	2.80
100% - FO	18,000	20.10	7.00	8.10	5.60
75% - FO	13,500	15.50	5.30	6.10	4.40
50% - FO	9,000	12.00	3.70	4.20	4.40
40% - FO	7,200	10.10	3.10	3.50	4.00
Maximum Steady State Emission Rate - Natural Gas		3.20	4.90	4.90	3.90
Maximum Steady State Emission Rate - Fuel Oil		20.10	7.00	8.10	5.60

5.1.1 NO_x, CO, VOC

Wartsila provided pound per event emissions data for NO_x, CO, and VOC for startup events that include an estimate of the emissions that occur during the length of time after the RICE is fired through the unit reaching the operating load and up until the catalyst has heated up to the design temperature. This is important to consider, as emissions of NO_x, CO, and VOC will not be fully controlled while the SCR and oxidation catalyst heat up to their design temperature, at which time full emissions control consistent with the BACT described in Section 4 is achieved. Typically, the length of time to get to the catalyst design temperature is longer than the time it takes for the engine to reach the operating load. Wartsila has estimated the RICE will take five (5) minutes to reach full load but then the SCR and oxidation catalysts will take 25 minutes longer before reaching design temperatures where full emissions control will be provided.

Therefore, per Wartsila, the event time, or the duration to reach emissions compliance, for each startup type is 30 minutes.

A RICE start up is categorized as cold, warm, or hot, based on the amount of downtime since the RICE was last in operation. The definitions for each start type are as follows:

- ▶ **Cold Start:** minimum downtime between starts of 48 hours
- ▶ **Warm Start:** minimum downtime between starts of 6 hours
- ▶ **Hot Start:** no minimum downtime between starts

Wartsila has estimated it takes less than one minute for the RICE to shut down, and emissions during this time are minimal.

The data for the startup and shutdown events, as provided by Wartsila, are summarized in Table 5-3 and Table 5-4 below.

Table 5-3. Vendor-Provided Startup Emissions – RICE

SU Case	Minimum Downtime Between Starts (hr)	Duration Until Full Control (min)	Vendor Startup Data			
			NO _x (lb/event)	CO (lb/event)	VOC (lb/event)	PM (lb/event)
Cold - NG	48	30	20.00	19.00	3.00	4.00
Warm - NG	6	30	14.00	16.00	1.90	4.00
Hot - NG	0	30	9.00	11.00	1.70	4.00
Cold - FO	48	30	105.00	8.00	4.00	6.00
Warm - FO	6	30	77.00	7.00	3.50	6.00
Hot - FO	0	30	61.00	6.00	3.00	6.00

Table 5-4. Vendor-Provided Shutdown Emissions – RICE

SD Case	Shutdown Duration (min)	Vendor Shutdown Data		
		NO _x (lb/event)	CO (lb/event)	VOC (lb/event)
Natural Gas Shutdown	1	0.06	0.09	0.09
Fuel Oil Shutdown	1	0.40	0.12	0.15

5.1.1.1 Maximum Hourly Emissions – NO_x, CO, VOC

Trinity considered the lb/event emission rates provided by the Wartsila as well as the duration of the startup and shutdown events along with the steady-state emission rates to determine the highest possible hourly emission rates for NO_x, CO, and VOC. Essentially, the hourly emission profiles were constructed using the highest emission rate from a combination of startup, steady state, and shutdown emissions occurring in any single hour. Trinity calculated the hourly emission rate considering the maximum number of each of the three (3) types of startups that could occur in one hour due to the required downtime between each start type (i.e. only one cold start can take place in an hour, but there could be two hot starts in an hour, because there is no required downtime between hot starts) and used the maximum emission rate among

the three scenarios presented below to establish the hourly PTE. Additionally, the hourly emission rate assumes that only one start can occur per hour if it is a cold or warm start.

Note, since the shutdown emissions are less than the emissions at steady state and only last one minute, the steady state emission rate was relied upon to cover the shutdown portion of the hour. To summarize, the maximum hourly emission rate from the following scenarios was used to define the hourly PTE for NO_x, CO, and VOC:

- ▶ **Cold Start Scenario:** One (1) Cold Start lasting 30 minutes followed by 30 minutes of steady state operation at 100% load;
- ▶ **Warm Start Scenario:** One (1) Warm Start lasting 30 minutes followed by 30 minutes of steady state operation at 100% load; and
- ▶ **Hot Start Scenario:** One (1) Hot Start lasting 30 minutes followed immediately by another Hot Start for the remaining 30 minutes.

5.1.1.1.1 Maximum Hourly Emission Rate – NO_x, CO, VOC – Natural Gas

As shown in Appendix C, the maximum hourly emission rate for NO_x and VOC for the RICE when firing natural gas is derived from the **Cold Start Scenario**, or one (1) Cold Start firing natural gas for 30 minutes followed by 30 minutes of steady state operation at 100% load when firing natural gas. For CO, the maximum hourly emission rate is derived from the **Hot Start Scenario**, or one (1) Hot Start firing natural gas for 30 minutes immediately followed by another Hot Start firing natural gas for the remaining 30 minutes. Detailed hourly emissions calculations can be found in Appendix C.

5.1.1.1.2 Maximum Hourly Emission Rate – NO_x, CO, VOC – Fuel Oil

As shown in Appendix C, the maximum hourly emission rate for NO_x, CO, and VOC for the RICE when firing fuel oil is derived from the **Hot Start Scenario**, or one (1) Hot Start firing fuel oil for 30 minutes immediately followed by another Hot Start firing fuel oil for the remaining 30 minutes. Detailed hourly emissions calculations can be found in Appendix C.

5.1.1.2 *Maximum Annual Emissions – NO_x, CO, VOC*

For NO_x, CO, and VOC, additional consideration was given to incorporate the emissions during startup events. Trinity considered the maximum number of startups that would be physically possible (i.e. a series of continuous hot starts that occur every 30 minutes for a year, a series of cold starts that occur every 48 hours for a year, etc.) and then incorporated some restrictions to reduce the PTE. In short, the PTE is based on the following considerations for RICE startups:

- ▶ No limits on the number of Cold Starts that can occur per year when firing either fuel type;
- ▶ No limits on the number of Warm Starts that can occur per year when firing either fuel type;
- ▶ No limits on the number of Hot Starts that can occur per year when firing natural gas; and an
- ▶ Operational limit of 3,000 Hot Starts per year per RICE when firing fuel oil.

To reiterate, in order to have a Cold Start, at least 48 hours of downtime must occur prior to the start, and in order to have a Warm Start, at least 6 hours of downtime has to occur prior to the start. Therefore, when evaluating the annual PTE for the controlled pollutants, multiple scenarios have to be considered. The following scenarios were considered, and the annual PTE was selected for each pollutant based on the maximum emission rate from the following scenarios:

- ▶ **Cold Start Scenario:** A Cold Start event followed by a Shutdown followed by 48 hours of downtime, repeated for the entire 12-month duration.
- ▶ **Warm Start Scenario:** A Warm Start event followed by a Shutdown followed by 6 hours of downtime, repeated for the entire 12-month duration.
- ▶ **Hot Start Scenario:**
 - **For Natural Gas:** a Hot Start followed by a Shutdown followed immediately by another Hot Start, repeated for the entire 12-month duration.
 - **For Fuel Oil:** 3,000 Hot Start events and 3,000 Shutdowns, with the remainder of the balance of the hours of the year being steady state operation using fuel oil at 100% load.

For example, as shown in Table 5-3 and Appendix C, while the lb/event emissions for a Cold Start are higher than the lb/event emissions for both Warm and Hot Starts, when looking at an annual profile, a significant amount downtime is required throughout the year to accommodate Cold Starts. The physically limited maximum number of Cold Starts per year is 181, which is calculated utilizing the definition of a Cold Start as provided by the vendor. Also shown in Appendix C is the large amount of downtime that has to physically occur in the Cold and Warm Start Scenarios, which exceeds 8,000 hours per year. Therefore, the annual PTE for the controlled pollutants, for both natural gas and fuel oil, is based on the Hot Start Scenario, which results in the highest annual PTE from the three (3) scenarios considered. The annual PTE and associated calculations can be found in Appendix C.

5.1.2 Particulate Matter

Wartsila provided emissions data for the RICE for particulate matter that cover a range of steady state operating loads (40%, 50%, 75%, and 100%). There is no control device specific to PM, which means that no consideration for startup and shutdown is required to calculate the PM PTE. The vendor-provided data considers both filterable and condensable portions; therefore, the PM PTE is based on the vendor-provided data and 8,760 hours of operation at 100% load. PM₁₀ and PM_{2.5} emissions were conservatively set equal to PM emissions. Detailed calculations can be found in Appendix C.

5.1.3 SO₂ and H₂SO₄

The SO₂ and H₂SO₄ emissions were estimated using a mass balance on the sulfur in the natural gas and fuel oil considering the fuel content of the fuel and the power output of the RICE at 100%. For natural gas, the max sulfur content was 2 grains per 100 standard cubic foot (2 gr/100 scf), and for fuel oil the max sulfur content is 15 ppmv. For H₂SO₄, it was assumed that 10% of the sulfur emitted is emitted as H₂SO₄. The maximum annual PTE was established using the maximum rate between the RICE operating on natural gas for 8,760 hours per year and the RICE operating on fuel oil for 8,760 hours per year.

5.1.4 HAPs (and Lead)

Wartsila provided controlled hourly emissions for formaldehyde when firing natural gas but did not provide emissions data for any other HAP when firing natural gas and did not provide any emissions data for HAPs when the RICE utilize fuel oil. For formaldehyde, when the RICE fire natural gas, hourly emissions are based on the data provided by Wartsila and annual emissions are based on the maximum hourly emission rate from Wartsila occurring for 8,760 hours per year. To reiterate, the formaldehyde emissions provided by Wartsila are inclusive of control that will be provided by the oxidation catalyst.

For all other HAPs emitted when natural gas is utilized, the hourly PTE is based on AP-42 Section 3.2, Table 3.2-2 emission factors. Note that the emissions factor for lead was used to represent both elemental lead and the HAP lead compounds. Additionally, because of the presence of the oxidation catalyst, Trinity

conservatively applied a 90% control efficiency for all organic HAPs. The hourly PTE for fuel oil operation for all HAPs is based on AP-42 Section 3.4, Table 3.4-3 emission factors and the same 90% control efficiency from the oxidation catalyst. The annual PTE was derived from taking the maximum hourly emission rate between natural gas and fuel oil operation and assuming it occurs for 8,760 hours per year. Detailed calculations for all HAP emissions for the RICE operating on either fuel can be found in Appendix C.

5.1.5 Greenhouse Gases

GHG emissions were calculated considering 40 CFR Part 98, Subpart C, Table C-1 and C-2 emission factors for both natural gas and fuel oil. CO₂ emission factors were obtained from Table C-1, and CH₄ and N₂O emission factors were obtained from Table C-2. Additionally, global warming potentials were obtained from 40 CFR Part 98, Subpart A, Table A-1 to convert emissions of CH₄ and N₂O to CO₂e. Hourly emissions were calculated using the discussed emission factors and the maximum heat input for each RICE, while annual emissions were calculated using the same emission factors from Part 98 and the annual heat input assuming the maximum hourly heat input occurs for 8,760 hours per year. Appendix C presents the GHG emissions for both natural gas and fuel oil operations.

5.1.6 RICE Potential Emissions Summary

The following tables summarize the hourly and annual PTE for the RICE when utilizing either fuel.

Table 5-5. Hourly PTE Summary – RICE

Pollutant	RICE PTE - Per Unit - Natural Gas (lb/hr)	RICE PTE - 12 Total RICE - Natural Gas (lb/hr)	RICE PTE - Per Unit - Fuel Oil (lb/hr)	RICE PTE - 12 Total RICE - Fuel Oil (lb/hr)
CO	22.00	264.00	12.00	144.00
NO _x	21.60	259.20	122.00	1,464.00
PM	3.90	46.80	5.60	67.20
PM ₁₀	3.90	46.80	5.60	67.20
PM _{2.5}	3.90	46.80	5.60	67.20
SO ₂	0.76	9.08	0.21	2.52
VOC	5.45	65.40	8.10	97.20
H ₂ SO ₄	0.12	1.39	0.03	0.39
Pb	-	-	-	-
Formaldehyde	0.25	3.00	0.00	0.01
Benzene	0.01	0.07	0.01	0.13
Total HAPs	0.51	6.14	0.02	0.29
CO ₂ e	15,828.53	189,942.42	23,127.51	277,530.18

Table 5-6. Annual PTE Summary – RICE

Pollutant	RICE PTE - Per Unit - Natural Gas (tpy)	RICE PTE - 12 Total RICE - Natural Gas (tpy)	RICE PTE - Per Unit - Fuel Oil (tpy)	RICE PTE - 12 Total RICE - Fuel Oil (tpy)
CO	94.01	1,128.17	34.42	412.98
NO _x	76.81	921.67	164.56	1,974.73
PM	17.08	204.98	24.53	294.34
PM ₁₀	17.08	204.98	24.53	294.34
PM _{2.5}	17.08	204.98	24.53	294.34
SO ₂	3.31	39.76	0.92	11.04
VOC	21.46	257.54	35.48	425.74
H ₂ SO ₄	0.51	6.09	0.14	1.69
Pb	-	-	-	-
Formaldehyde	1.10	13.14	0.00	0.06
Benzene	0.03	0.31	0.05	0.58
Total HAPs	2.24	26.90	0.11	1.27
CO ₂ e	69,328.98	831,947.79	101,298.51	1,215,582.18

5.2 Siemens Simple Cycle CT Potential Emissions

When operating in simple cycle, the four (4), 260 MW Siemens SGT6-5000F combustion turbines (CTs) will be capable of firing either natural gas or diesel, and they will emit NO_x, CO, SO₂, VOC, PM, PM₁₀, PM_{2.5}, Pb, H₂SO₄, and HAPs once installed. The calculations take into consideration that each CT will be equipped with an SCR system for the control of NO_x and an oxidation catalyst for the control of CO and VOC, regardless if the CT is operating in simple or combined cycle. Both air pollution control systems are catalytic systems that require a specific temperature range to fully function. The incorporation of the effect of the catalysts warrants careful consideration when estimating the potential emissions of NO_x, CO, and VOC.

Steady state emissions are based on the proposed BACT described in Section 4, which is derived from vendor-provided pound per hour emissions data or published emission factors. Siemens provided emissions data for the CTs that cover a range of steady state operating loads (minimum emissions compliance load (MECL), 75%, and 100%) at multiple ambient conditions (-13.9 F, -1.9 F, 6.5 F, 59 F, 95.2 F, and 106.8 F) for both fuels. For each load and ambient condition, Siemens included the maximum outlet exhaust concentration and the maximum hourly emission rates for NO_x, CO, VOC, SO₂, and total particulates.

Based on the data provided by Siemens, the highest hourly emissions for all loads occur during the -13.9 F, or "extreme winter", ambient condition. Therefore, for the remainder of this analysis, for PTE purposes, only the extreme winter cases will be considered. Additionally, for NO_x emissions when operating in simple cycle firing natural gas, the vendor provided emissions estimates based on an outlet concentration of 2.5 ppmv. However, as described in Section 4 of this application, NPPD is proposing a primary NO_x BACT limit of 3 ppmv for the simple cycle turbines when firing natural gas. Because of this, the pound per hour estimates provided by Siemens were adjusted upward to accommodate the 3 ppmv proposed primary BACT limit. Tables 5-7 and 5-8 show the vendor provided hourly emission rates for natural gas and fuel oil.

Table 5-7. Vendor-Provided Steady State Emissions – Simple Cycle CTs – Natural Gas

Case ID	Case Description	Natural Gas Operation				
		NO _x (lb/hr)	CO (lb/hr)	VOC (lb/hr)	PM (lb/hr)	SO ₂ (lb/hr)
Case 1	Extreme Winter, 100% Load	28.08	11.40	6.50	10.70	3.70
Case 2	Extreme Winter, 75% Load	22.68	9.20	5.30	8.90	3.00
Case 3	Extreme Winter, MECL	15.60	6.30	3.60	6.80	2.10
For Hourly PTE: Maximum Steady-State Emission Rate		28.08	11.40	6.50	10.70	3.70

Table 5-8. Vendor-Provided Steady State Emissions – Simple Cycle CTs – Fuel Oil

Case ID	Case Description	Fuel Oil Operation				
		NO _x (lb/hr)	CO (lb/hr)	VOC (lb/hr)	PM (lb/hr)	SO ₂ (lb/hr)
Case 1	Extreme Winter, 100% Load	45.70	11.10	6.40	30.00	3.60
Case 2	Extreme Winter, 75% Load	37.10	9.00	5.20	30.00	2.90
Case 3	Extreme Winter, MECL	29.50	7.20	4.10	30.00	2.30
For Hourly PTE: Maximum Steady-State Emission Rate		45.70	11.10	6.40	30.00	3.60

5.2.1 NO_x, CO, VOC, and Particulate Matter

5.2.1.1 Startup Emissions

Siemens provided pound per event emissions data for NO_x, CO, VOC, and PM for startup events that include an estimate of the emissions that occur during the length of time after the CT first fires fuel through the unit reaching the operating load and up until the catalyst has heated up to the design temperature. This is important to consider, as emissions of NO_x, CO, and VOC will not be fully controlled while the SCR and oxidation catalyst heat up to their design temperature, at which time full emissions control consistent with the BACT described in Section 4 is achieved.

Although there is no control device specific to PM, based on the startup emissions provided by Siemens, on a lb/min basis, startup PM emissions are higher than PM emissions during steady state, 100% load operation. Therefore, the PM PTE considers startup emissions.

Siemens provided information on three (3) different startup types, which include two (2) different natural gas startup types and a fuel oil startup. The natural gas startups differ by the ramp rate of the CT; the 52 MW/min ramp rate startup reaches full load earlier than the 20 MW/min ramp rate startup. Additionally, per the vendor, no consideration is made for downtime between startups, as there is no difference in the lb/event emissions due to more or less downtime since the last operation of the unit.

Typically, the length of time to get to the catalyst design temperature is longer than the time it takes for the engine to reach the operating load. For the three (3) startup types provided, Siemens estimated the SCR and oxidation catalysts will take anywhere from 20 to 42 minutes to reach the design temperatures where

full emissions control will be provided. The event time, or the duration to reach emissions compliance, for each startup type is noted below per data from Siemens.

Table 5-9. Vendor-Provided Startup Emissions – Simple Cycle CTs

Fuel Type	Startup Profile	Startup Duration (min)	Vendor Startup Emissions			
			NOx (lb/event)	CO (lb/event)	VOC (lb/event)	PM (lb/event)
NG	Natural Gas Startup - 20 MW/min Ramp Rate	28	61.00	843.14	73.00	5.00
NG	Natural Gas Startup - 52 MW/min Ramp Rate	20	42.00	577.84	50.00	4.00
FO	Fuel Oil Startup	42	147.80	2,480.33	316.75	25.00

5.2.1.2 Shutdown Emissions

In addition to startup emissions, Siemens also provided NOx, CO, VOC, and PM emissions for four (4) different shutdown types. An analysis was completed to determine if the shutdown emissions should be included in the emissions profile establishing the PTE, and the lb/min shutdown emissions were compared to emissions at 100% load, steady state operation. As shown in Appendix C, on a lb/min basis, for all pollutants provided, shutdown emissions are higher than steady state emissions based on the data provided by Siemens, so these emissions warrant consideration in the PTE calculations.

Two (2) natural gas and two (2) fuel oil shutdown profiles were provided, which differ based on their lb/event emissions, the shutdown duration, or the duration from the specified load to fuel cut off, the ramp rate of the turbine, and the steady state load that the start of shutdown occurs at. The vendor-provided shutdown data is shown below.

Table 5-10. Vendor-Provided Shutdown Emissions – Simple Cycle CTs

Fuel Type	Shutdown Profile	Shutdown Duration (min)	Vendor Shutdown Emissions			
			NOx (lb/event)	CO (lb/event)	VOC (lb/event)	PM (lb/event)
NG	100% Load to Fuel Cut Off - 20 MW/min - NG	13	18.00	173.16	27.00	3.00
NG	100% Load to Fuel Cut Off - 52 MW/min - NG	5	6.00	66.72	11.00	2.00
FO	50% Load to Fuel Cut Off - FO	9	23.00	179.61	72.16	6.00
FO	100% Load to Fuel Cut Off - FO	18	29.00	180.73	72.62	13.00

5.2.1.3 Maximum Hourly Emissions – NOx, CO, VOC, PM

Based on the startup, shutdown, and steady state emissions provided, the PTE was calculated considering a worst-case hour consisting of one (1) startup event, one (1) shutdown event, and the balance of the hour being steady state operation at 100% load. Multiple scenarios had to be evaluated, as multiple startup and shutdown types were provided for each fuel, and the PTE was calculated based on which permutation of

these different event types resulted in the highest hourly emissions for both fuels. Appendix C provides detail on the components of each permutation considered, the hourly emissions calculated for all, and the final emission rate selected as the PTE.

5.2.1.3.1 Maximum Hourly Emissions – NO_x, CO, VOC, and PM – Natural Gas

For NO_x, CO, and VOC, the permutation which results in the highest hourly emissions for natural gas consists of a 28-minute, 20 MW/min startup, a 12-minute, 20 MW/min shutdown, and 19 minutes of steady state operation at 100% load using natural gas.

For PM, the permutation which results in the hourly PTE is slightly different. The PM hourly PTE is based on a 20-minute, 52 MW/min startup, a 5-minute, 52 MW/min shutdown, and 35 minutes of steady state operation at 100% load using natural gas.

5.2.1.3.2 Maximum Hourly Emissions – NO_x, CO, VOC, and PM – Fuel Oil

For NO_x, CO, and VOC, the permutation which results in the highest hourly emissions for fuel oil consists of a 42-minute fuel oil startup and an 18-minute fuel oil shutdown from 100% load. Note that no steady state operation takes place in this scenario, as the startup and shutdown portions consume the entire hour.

The PM hourly PTE for fuel oil is based on a 42-minute fuel oil startup, a 9-minute fuel oil shutdown from 50% load, and 9 minutes of steady state operation.

5.2.1.4 Maximum Annual Emissions – NO_x, CO, VOC, PM

Similar to the calculation methodology for the hourly PTE, the annual PTE also looks at multiple permutations of different startup, shutdown, and steady state emissions occurring over an entire year. NPPD is also requesting the following operational limits specific to the number of startups when the CTs operate in simple cycle, and these limits are considered in the annual PTE presented in Appendix C. Emissions for all permutations considered are presented in Appendix C along with the maximum annual emission rate which is being proposed as the PTE.

- ▶ Operational limit of 8,760 Startups per year per CT in simple cycle when firing natural gas.
- ▶ Operational limit of 1,000 Startups per year per CT in simple cycle when firing fuel oil.

To summarize, the annual PTE for NO_x, CO, and VOC when firing natural gas is based on the following worst-case scenario:

- ▶ 8,760, 20 MW/min natural gas startup events (8,760 SU @ 28 min = 4,091 hours in startup)
- ▶ 8,760, 20 MW/min natural gas shutdown events (8,760 SD @ 13 min = 1,898 hours in shutdown)
- ▶ Balance of the year (2,771 hours) is steady state operation at 100% load

The annual PTE for PM when firing natural gas is based on the following worst-case scenario.

- ▶ 8,760, 52 MW/min natural gas startup events (8,760 SU @ 20 min = 2,921 hours in startup)
- ▶ 8,760, 52 MW/min natural gas shutdown events (8,760 SD @ 5 min = 730 hours in shutdown)
- ▶ Balance of the year (5,109 hours) is steady state operation at 100% load

The annual PTE for NO_x, CO, and VOC when firing fuel oil is based on the following worst-case scenario.

- ▶ 1,000, fuel oil startup events (1,000 SU @ 42 min = 700 hours in startup)

- ▶ 1,000, fuel oil shutdown events from 50% load (1,000 SD @ 9 min = 150 hours in shutdown)
- ▶ Balance of the year (7,910 hours) is steady state operation at 100% load

The annual PTE for PM when firing fuel oil is based on the following worst-case scenario.

- ▶ 1,000, fuel oil startup events (1,000 SU @ 42 min = 700 hours in startup)
- ▶ 1,000, fuel oil shutdown events from 100% load (1,000 SD @ 18 min = 300 hours in shutdown)
- ▶ Balance of the year (7,760 hours) is steady state operation at 100% load

5.2.2 SO₂ and H₂SO₄

Siemens provided hourly emission estimates for SO₂ at various loads and ambient conditions when the CTs are operating in simple cycle, as shown in Tables 5-7, 5-8, and Appendix B. The hourly SO₂ PTE is based on the vendor-provided information at 100% for both fuels, and the annual PTE assumes the maximum hourly PTE occurring for 8,760 hours per year.

The H₂SO₄ emissions were estimated using a mass balance on the sulfur in the natural gas and fuel oil considering the fuel content of the fuel and the power output of the CT at 100% load. For natural gas, the max sulfur content was 2 grains per 100 standard cubic foot (2 gr/100 scf), and for fuel oil the max sulfur content is 15 ppmv. For H₂SO₄, it was assumed that 10% of the sulfur emitted is emitted as H₂SO₄.

5.2.3 HAPs (and Lead)

The CTs will emit various hazardous air pollutants, and Siemens did not provide any HAP emissions estimates. Therefore, for all HAPs emitted when natural gas is utilized, the hourly PTE is based on AP-42 Section 3.1, Table 3.1-3 emission factors. Additionally, because of the presence of the oxidation catalyst, Trinity applied a 90% control efficiency for all organic HAPs. The hourly PTE for fuel oil operation for all HAPs is based on AP-42 Section 3.1, Table 3.1-4 emission factors for organic HAPs and the same 90% control efficiency from the oxidation catalyst. Metal HAP emissions when firing fuel oil are based on AP-42 Section 3.1, Table 3.1-5 emission factors. Note that the emissions factor for lead was used to represent both elemental lead and the HAP lead compounds. The annual PTE was derived from taking the maximum hourly emission rate between natural gas and fuel oil operation and assuming it occurs for 8,760 hours per year. Detailed calculations for all HAP emissions for the CTs operating on either fuel can be found in Appendix C.

5.2.4 Greenhouse Gases

GHG emissions were calculated considering 40 CFR Part 98, Subpart C, Table C-1 and C-2 emission factors for both natural gas and fuel oil. CO₂ emission factors were obtained from Table C-1, and CH₄ and N₂O emission factors were obtained from Table C-2. Additionally, global warming potentials were obtained from 40 CFR Part 98, Subpart A, Table A-1 to convert emissions of CH₄ and N₂O to CO₂e. Hourly emissions were calculated using the discussed emission factors and the maximum heat input for each CT, while annual emissions were calculated using the same emission factors from Part 98 and the annual heat input assuming the maximum hourly heat input occurs for 8,760 hours per year. Appendix C presents the GHG emissions for both natural gas and fuel oil operations.

5.2.5 Simple Cycle CTs Potential Emissions Summary

The following tables summarize the hourly and annual PTE for the Simple Cycle CTs when utilizing either fuel.

Table 5-11. Hourly PTE Summary – Simple Cycle CTs

Pollutant	Simple Cycle CT PTE - Per Unit - Natural Gas (lb/hr)	Simple Cycle CT PTE - 4 Total CTs - Natural Gas (lb/hr)	Simple Cycle CT PTE - Per Unit - Fuel Oil (lb/hr)	Simple Cycle CT PTE - 4 Total CTs - Fuel Oil (lb/hr)
CO	1,019.90	4,079.61	2,661.60	10,646.40
NO _x	87.88	351.53	177.63	710.53
PM	12.24	48.96	38.00	152.00
PM ₁₀	12.24	48.96	38.00	152.00
PM _{2.5}	12.24	48.96	38.00	152.00
SO ₂	3.70	14.80	3.60	14.40
VOC	102.06	408.22	389.87	1,559.48
H ₂ SO ₄	2.15	8.60	0.48	1.94
Pb	-	-	2.99E-02	0.12
Formaldehyde	0.18	0.71	0.06	0.24
Manganese	-	-	1.69	6.74
Total HAPs	0.26	1.03	1.93	7.72
CO ₂ e	293,914.54	1,175,658.18	348,936.64	1,395,746.57

Table 5-12. Annual PTE Summary – Simple Cycle CTs

Pollutant	Simple Cycle CT PTE - Per Unit - Natural Gas (tpy)	Simple Cycle CT PTE - 4 Total CTs - Natural Gas (tpy)	Simple Cycle CT PTE - Per Unit - Fuel Oil (tpy)	Simple Cycle CT PTE - 4 Total CTs - Fuel Oil (tpy)
CO	4,467.18	17,868.71	1,373.87	5,495.47
NO _x	384.92	1,539.69	266.13	1,064.53
PM	53.61	214.45	135.39	541.57
PM ₁₀	53.61	214.45	135.39	541.57
PM _{2.5}	53.61	214.45	135.39	541.57
SO ₂	16.21	64.82	15.77	63.07
VOC	447.01	1,788.02	219.77	879.07
H ₂ SO ₄	9.42	37.68	2.12	8.50
Pb	-	-	1.31E-01	0.52
Formaldehyde	0.78	3.12	0.26	1.05
Manganese	-	-	7.38	29.52
Total HAPs	1.13	4.52	8.45	33.80
CO ₂ e	1,287,345.71	5,149,382.83	1,528,342.50	6,113,369.99

5.3 Siemens Combined Cycle CT Potential Emissions

Three (3) of the four (4) CTs that NPPD is proposing to install will have the ability to operate both in simple cycle and in a 3X1 combined cycle system. The combined cycle system will consist of three (3) CTs, three (3) heat recovery steam generators (HRSG) (one (1) for each CT), and one (1) steam turbine that will serve all three (3) HRSGs. The three (3) Siemens CTs will also be able to fire either natural gas or diesel while in combined cycle, and emissions will be exhausted from the HRSG stack when in combined cycle. Similar to when the CTs operate in simple cycle, the calculations take into consideration that each HRSG stack will be equipped with an SCR system for the control of NO_x and an oxidation catalyst for the control of CO and VOC. Both air pollution control systems are catalytic systems that require a specific temperature range to fully function. The incorporation of the effect of the catalysts warrants careful consideration when estimating the potential emissions of NO_x, CO, and VOC.

Steady state emissions during combined cycle operation are based on the proposed BACT described in Section 4, which is derived from vendor-provided pound per hour emissions data or published emission factors. Siemens provided emissions data for the CTs that cover a range of steady state operating loads (minimum emissions compliance load (MECL), 75%, and 100%) at multiple ambient conditions (-13.9 F, -1.9 F, 6.5 F, 59 F, 95.2 F, and 106.8 F) for both fuels. For each load and ambient condition, Siemens included the maximum outlet exhaust concentration and the maximum hourly emission rates for NO_x, CO, VOC, SO₂, and total particulates.

Based on the data provided by Siemens, the highest hourly emissions for all loads occur during the -13.9 F, or "extreme winter", ambient condition. Therefore, for the remainder of this analysis, for PTE purposes, only the extreme winter cases will be considered. Tables 5-13 and 5-14 show the vendor-provided hourly rates for natural gas and fuel oil.

Table 5-13. Vendor-Provided Steady State Emissions – Combined Cycle CTs – Natural Gas

Case ID	Case Description	Natural Gas Operation				
		NO _x (lb/hr)	CO (lb/hr)	VOC (lb/hr)	PM (lb/hr)	SO ₂ (lb/hr)
Case 1	Extreme Winter, 100% Load	23.20	11.30	6.50	10.60	3.60
Case 2	Extreme Winter, 75% Load	18.80	9.10	5.20	8.80	3.00
Case 3	Extreme Winter, MECL	12.90	6.30	3.60	6.80	2.00
For Hourly PTE: Maximum Steady-State Emission Rate		23.20	11.30	6.50	10.60	3.60

Table 5-14. Vendor-Provided Steady State Emissions – Combined Cycle CTs – Fuel Oil

Case ID	Case Description	Fuel Oil Operation				
		NO _x (lb/hr)	CO (lb/hr)	VOC (lb/hr)	PM (lb/hr)	SO ₂ (lb/hr)
Case 1	Extreme Winter, 100% Load	45.50	11.10	6.40	30.00	3.60
Case 2	Extreme Winter, 75% Load	37.00	9.00	5.20	30.00	2.90
Case 3	Extreme Winter, MECL	28.60	7.00	4.00	30.00	2.30
For Hourly PTE: Maximum Steady-State Emission Rate		45.50	11.10	6.40	30.00	3.60

5.3.1 NO_x, CO, VOC, PM, SO₂

5.3.1.1 Startup Emissions

Siemens provided pound per event emissions data for NO_x, CO, VOC, PM, and SO₂ for combined cycle startup events that include an estimate of the emissions that occur between the first fire of fuel in the CT and when the catalysts are up to design operating temperature (emissions compliance). For combined cycle, the vendor also provided a separate set of startup emissions from the first fire of fuel all the way to 100% load combined cycle operation. Both are important to consider, as emissions of NO_x, CO, and VOC will not be fully controlled while the SCR and oxidation catalyst heat up to their design temperature, at which time full emissions control consistent with the BACT for combined cycle described in Section 4 is achieved. Additionally, unlike for the RICE and CTs, the catalysts heat up to their design temperature (reach emissions compliance) before the combined cycle operation reaches 100% load, so it is required to categorize startup emissions as Siemens has.

Siemens provided startup emissions estimates for PM, but there is no control device specifically controlling PM, so a comparison between startup emissions and steady state emissions was completed on a lb/min basis. As shown in Appendix C, for natural gas, for all pollutants and startup types, steady state PM emissions are higher on a lb/min basis than startup emissions; therefore, no consideration for startup was made when calculating the PM PTE for combined cycle when operating on natural gas. For fuel oil, startup emissions are higher than steady state emissions, so an allotment for startup was made for PM when operating on fuel oil only.

Siemens also provided startup emissions estimates for SO₂, but there is also no control device specifically controlling SO₂, so the same comparison was made for SO₂ as was done for PM. When firing natural gas, steady state lb/min emissions are higher than startup lb/min emissions, so no consideration for startup was made for SO₂ emissions when operating in combined cycle using natural gas. However, for fuel oil operations, SO₂ startup emissions are higher than steady state emissions on a lb/min basis, so startup needs to be considered when calculating the SO₂ PTE when firing fuel oil in combined cycle.

Siemens has categorized the start types for combined cycle similar to how Wartsila categorized the start types for the RICE, in terms of Cold, Warm, and Hot starts. The definitions for each start type are as follows:

- **Cold Start:** minimum downtime between starts of 64 hours

- ▶ **Warm Start:** minimum downtime between starts of 16 hours
- ▶ **Hot Start:** no minimum downtime between starts

Typically, the length of time to get to the catalyst design temperature is longer than the time it takes the CT to reach the specified operating load. However, in the case of combined cycle, the duration to reach full operating load is much longer than it is for the RICE or simple cycle operation, so the catalyst is often providing emissions control before the combined cycle system is at 100% load. For each start type (cold, warm, and hot) and fuel type, Siemens provided emissions estimates and durations from the time of first fire to emissions compliance (Startup Portion 1) and then emissions estimates and durations from the time of first fire to 100% load and full operation of the combined cycle system (Full Startup Profile). Table 5-15 shows all the startup emissions estimates provided by Siemens along with the duration of the full startup, the duration of each profile provided, and the required amount of downtime for each start type.

Table 5-15. Vendor-Provided Startup Emissions – Combined Cycle CTs – Natural Gas and Fuel Oil

Startup Case	Description of Start Case	Fuel Type	Minimum Downtime Between Starts (hr)	Duration of Event (min)	Vendor Startup Emissions				
					NOx (lb/event)	CO (lb/event)	VOC (lb/event)	PM (lb/event)	SO ₂ (lb/event)
Cold Start Step 1 (to Emissions Compliance)	"Cold" SU (GT Ignition to Emissions Compliance @ 60% GT Load)	NG	64	54	101.65	811.73	144.27	7.20	0.57
Cold Start Full Profile (to Full Load)	"Cold" SU (GT Ignition to 100% GT Load and STB Valves Closed)	NG	64	178	123.86	825.13	147.41	24.00	2.69
Warm Start Step 1 (to Emissions Compliance)	"Warm" SU (GT Ignition to Emissions Compliance @ 60% GT Load)	NG	16	49	89.95	716.38	126.83	6.50	0.52
Warm Start Full Profile (to Full Load)	"Warm" SU (GT Ignition to 100% GT Load and STB Valves Closed)	NG	16	110	101.17	723.07	128.61	14.90	1.58
Hot Start Step 1 (to Emissions Compliance)	"Hot" SU (GT Ignition to Emissions Compliance @ 60% GT Load)	NG	0	44	78.15	621.08	109.31	5.90	0.47
Hot Start Full Profile (to Full Load)	"Hot" SU (GT Ignition to 100% GT Load and STB Valves Closed)	NG	0	80	84.90	625.14	110.57	10.90	1.10
Cold Start Step 1 (to Emissions Compliance)	"Cold" SU (GT Ignition to Emissions Compliance @ 70% GT Load)	FO	64	90	157.44	1,625.04	237.47	45.30	18.74
Cold Start Full Profile (to Full Load)	"Cold" SU (GT Ignition to STB Valves Closed)	FO	64	159	209.18	1,638.36	242.37	79.80	41.37
Warm Start Step 1 (to Emissions Compliance)	"Warm" SU (GT Ignition to Emissions Compliance @ 70% GT Load)	FO	16	70	145.93	1,622.59	236.07	35.30	13.71
Warm Start Full Profile (to Full Load)	"Warm" SU (GT Ignition to STB Valves Closed)	FO	16	113	178.08	1,631.38	239.47	56.80	27.76
Hot Start Step 1 (to Emissions Compliance)	"Hot" SU (GT Ignition to Emissions Compliance @ 70% GT Load)	FO	0	52	128.40	1,363.91	234.81	26.30	9.18
Hot Start Full Profile (to Full Load)	"Hot" SU (GT Ignition to STB Valves Closed)	FO	0	76	146.00	1,370.31	237.71	38.30	16.88

5.3.1.2 Shutdown Emissions

In addition to startup emissions, Siemens also provided NO_x, CO, VOC, SO₂, and PM emissions for four (4) different combined cycle shutdown types. An analysis was completed to determine if the shutdown emissions should be included in the emissions profile establishing the PTE, and the lb/min shutdown emissions were compared to emissions at 100% load, steady state operation. Similar to startup emissions, shutdown emissions are higher than steady state emissions on a lb/min basis for NO_x, CO, and VOC for both fuels and for PM and SO₂ when firing fuel oil. Steady state lb/min emissions were higher for PM and SO₂ when firing natural gas, so shutdown emissions were not considered in those cases for PTE development.

Two (2) natural gas and two (2) fuel oil shutdown profiles were provided, which differ based on their lb/event emissions, the steady state load that the start of shutdown occurs at, and the shutdown duration. The vendor-provided shutdown data is shown below.

Table 5-16. Vendor-Provided Shutdown Emissions – Combined Cycle CTs

Shutdown Case	Fuel Type	Duration of Event (min)	Vendor Shutdown Emissions				
			NO _x (lb/event)	CO (lb/event)	VOC (lb/event)	PM (lb/event)	SO ₂ (lb/event)
60% Load Shutdown - NG	NG	13	16.00	83.02	32.83	1.80	0.15
100% Load Shutdown - NG	NG	25	19.00	84.65	33.53	3.60	0.39
70% Load Shutdown - FO	FO	18	37.00	179.14	67.83	9.10	2.91
100% Load Shutdown - FO	FO	25	42.00	180.78	68.53	13.00	5.10

5.3.1.3 Maximum Hourly Emissions – NO_x, CO, VOC, PM, SO₂

As shown in Table 5-15, for all startup types for both fuels, the total startup duration to reach combined cycle operating load (100% GT load and STB valves closed) is greater than one (1) hour. Because startup emissions are higher than both steady state and shutdown emissions on a lb/min basis, and because the full startup durations are greater than one (1) hour, only startup emissions were considered when calculating the hourly PTE for NO_x, CO, and VOC when firing either fuel and for PM and SO₂ when firing fuel oil only.

Combined cycle is different compared to the RICE and simple cycle operation in that it takes longer to reach full operating load in combined cycle than it does for the SCR and oxidation catalyst to reach the design temperature and provide emissions control. Because of this, the large majority of the lb/event emissions occur during "Step 1" of the emissions data provided or the period of time prior to emissions compliance. Therefore, the PTE calculations assume that the entirety of the "Step 1" emissions occur if the duration is less than an hour, and the remainder of the hour is assumed to be Full Startup emissions minus Step 1 emissions ratioed downward to the remaining time in the hour. If the "Step 1" duration is greater than one (1) hour (for two (2) of the fuel oil cases), then the total "Step 1" emissions are ratioed downward to calculate the portion that occurs in 60 minutes. Below is a summary of the emissions scenario which defines the combined cycle hourly PTE for each pollutant and fuel type. Appendix C shows all of the startup types considered and the hourly emissions for each.

For Natural Gas:

- ▶ NO_x: 54-minute Cold Start Step 1 (to emissions compliance) emissions followed by 6 minutes of Cold Start Full Profile emissions.
- ▶ CO: 54-minute Cold Start Step 1 (to emissions compliance) emissions followed by 6 minutes of Cold Start Full Profile emissions.
- ▶ VOC: 54-minute Cold Start Step 1 (to emissions compliance) emissions followed by 6 minutes of Cold Start Full Profile emissions.
- ▶ SO₂: 60 minutes of 100% load, steady state operation at extreme winter ambient conditions.
- ▶ PM: 60 minutes of 100% load, steady state operation at extreme winter ambient conditions.

For Fuel Oil:

- ▶ NO_x: 52-minute Hot Start Step 1 (to emissions compliance) emissions followed by 8 minutes of Hot Start Full Profile emissions.
- ▶ CO: 60 minutes of Warm Start Step 1 (to emissions compliance) emissions.
- ▶ VOC: 52-minute Hot Start Step 1 (to emissions compliance) emissions followed by 8 minutes of Hot Start Full Profile emissions.
- ▶ SO₂: 60 minutes of Cold Start Step 1 (to emissions compliance) emissions.
- ▶ PM: 52-minute Hot Start Step 1 (to emissions compliance) emissions followed by 8 minutes of Hot Start Full Profile emissions.

5.3.1.4 Maximum Annual Emissions – NO_x, CO, VOC, PM, SO₂

For PM and SO₂ when firing natural gas, the maximum annual PTE is based on the maximum hourly steady state emissions at 100% load and extreme winter ambient conditions occurring for 8,760 hours per year.

For NO_x, CO, and VOC when firing either fuel and for PM and SO₂ when firing fuel oil, an evaluation was completed to determine which permutation of steady state, startup, and shutdown profiles results in the maximum annual PTE for combined cycle. Appendix C shows all of the permutations considered for the various startup and shutdown types. During the analysis, it is important to consider the required downtime along with the duration of both startup and shutdown to calculate the maximum amount of physically possible startups. For example, a Cold Start on natural gas takes 178 minutes, a shutdown from 100% load takes 25 minutes, and there is at least 64 hours of downtime required before the next Cold Start can occur. Therefore, only 130 Cold Start, natural gas SUSD events are physically possible in a year, and the rest of the year would be required downtime.

For hot starts on natural gas, because there is no required downtime between each event, the annual PTE evaluation considers a series of continuous hot starts and shutdowns that last for 80 and 25 minutes, respectively. For hot starts on fuel oil, NPPD is requesting an operational limit of 1,000 hot starts per year per CT on fuel oil and no restrictions on hot starts on natural gas. Below is a summary of the scenarios which result in the annual PTE for each pollutant and fuel type.

For Natural Gas:

- ▶ NO_x: Hot Start followed by a 60% Load Shutdown repeated continuously for an entire year.
- ▶ CO: Hot Start followed by a 60% Load Shutdown repeated continuously for an entire year.
- ▶ VOC: Hot Start followed by a 60% Load Shutdown repeated continuously for an entire year.
- ▶ SO₂: 8,760 hours of 100% load, steady state operation at extreme winter ambient conditions.
- ▶ PM: 8,760 hours of 100% load, steady state operation at extreme winter ambient conditions.

For Fuel Oil:

- ▶ NO_x: 1,000 Hot Starts, 1,000 100% Load Shutdowns, with the balance of the hours of the year being steady state operation at 100% load and extreme winter ambient conditions.
- ▶ CO: 1,000 Hot Starts, 1,000 100% Load Shutdowns, with the balance of the hours of the year being steady state operation at 100% load and extreme winter ambient conditions.
- ▶ VOC: 1,000 Hot Starts, 1,000 100% Load Shutdowns, with the balance of the hours of the year being steady state operation at 100% load and extreme winter ambient conditions.
- ▶ SO₂: 1,000 Hot Starts, 1,000 100% Load Shutdowns, with the balance of the hours of the year being steady state operation at 100% load and extreme winter ambient conditions.
- ▶ PM: 1,000 Hot Starts, 1,000 100% Load Shutdowns, with the balance of the hours of the year being steady state operation at 100% load and extreme winter ambient conditions.

5.3.2 H₂SO₄

The H₂SO₄ emissions were estimated using a mass balance on the sulfur in the natural gas and fuel oil considering the fuel content of the fuel and the power output of the CT at 100% load. For natural gas, the max sulfur content was 2 grains per 100 standard cubic foot (2 gr/100 scf), and for fuel oil the max sulfur content is 15 ppmv. For H₂SO₄, it was assumed that 10% of the sulfur emitted is emitted as H₂SO₄.

5.3.3 HAPs (and Lead)

The CTs will emit various hazardous air pollutants when operating in combined cycle, and Siemens did not provide any HAP emissions estimates. Therefore, for all HAPs emitted when natural gas is utilized, the hourly PTE is based on AP-42 Section 3.1, Table 3.1-3 emission factors. Additionally, because of the presence of the oxidation catalyst, Trinity applied a 90% control efficiency for all organic HAPs. The hourly PTE for fuel oil operation for all HAPs is based on AP-42 Section 3.1, Table 3.1-4 emission factors for organic HAPs and the same 90% control efficiency from the oxidation catalyst. Metal HAP emissions when firing fuel oil are based on AP-42 Section 3.1, Table 3.1-5 emission factors. The annual PTE was derived from taking the maximum hourly emission rate between natural gas and fuel oil operation and assuming it occurs for 8,760 hours per year. Detailed calculations for all HAP emissions for the CTs operating on either fuel can be found in Appendix C.

5.3.4 Greenhouse Gases

GHG emissions were calculated considering 40 CFR Part 98, Subpart C, Table C-1 and C-2 emission factors for both natural gas and fuel oil. CO₂ emission factors were obtained from Table C-1, and CH₄ and N₂O emission factors were obtained from Table C-2. Additionally, global warming potentials were obtained from 40 CFR Part 98, Subpart A, Table A-1 to convert emissions of CH₄ and N₂O to CO₂e. Hourly emissions were calculated using the discussed emission factors and the maximum heat input for each CT, while annual emissions were calculated using the same emission factors from Part 98 and the annual heat input assuming the maximum hourly heat input occurs for 8,760 hours per year. Appendix C presents the GHG emissions for both natural gas and fuel oil operations.

5.3.5 Combined Cycle CTs Potential Emissions Summary

The following tables summarize the hourly and annual PTE for the Combined Cycle CTs when utilizing either fuel.

Table 5-17. Hourly PTE Summary – Combined Cycle CTs

Pollutant	Combined Cycle CT PTE - 1X1 - Natural Gas (lb/hr)	Combined Cycle CT PTE - 3X1 - Natural Gas (lb/hr)	Combined CT PTE - 1X1 - Fuel Oil (lb/hr)	Combined Cycle CT PTE - 3X1 - Fuel Oil (lb/hr)
CO	812.38	2,437.14	1,390.83	4,172.50
NO _x	102.72	308.17	134.27	402.81
PM	10.60	31.80	30.30	90.90
PM ₁₀	10.60	31.80	30.30	90.90
PM _{2.5}	10.60	31.80	30.30	90.90
SO ₂	3.60	10.80	12.50	37.49
VOC	144.42	433.27	235.77	707.32
H ₂ SO ₄	2.13	6.40	0.52	1.55
Pb	-	-	1.39E-01	0.42
Formaldehyde	0.18	0.53	0.06	0.19
Manganese	-	-	1.79	5.37
Total HAPs	0.26	0.77	2.05	6.15
CO ₂ e	291,559.05	874,677.16	370,982.63	1,112,947.90

Table 5-18. Annual PTE Summary – Combined Cycle CTs

Pollutant	Combined Cycle CT PTE - 1X1 - Natural Gas (tpy)	Combined Cycle CT PTE - 3X1 - Natural Gas (tpy)	Combined CT PTE - 1X1 - Fuel Oil (tpy)	Combined Cycle CT PTE - 3X1 - Fuel Oil (tpy)
CO	2,004.18	6,012.55	814.82	2,444.47
NO _x	285.57	856.70	255.00	764.99
PM	46.43	139.28	131.80	395.40
PM ₁₀	46.43	139.28	131.80	395.40
PM _{2.5}	46.43	139.28	131.80	395.40
SO ₂	15.77	47.30	23.73	71.18
VOC	405.84	1,217.52	175.76	527.29
H ₂ SO ₄	9.34	28.03	2.26	6.78
Pb	-	-	1.39E-01	0.42
Formaldehyde	0.77	2.32	0.28	0.83
Manganese	-	-	7.85	23.54
Total HAPs	1.12	3.36	8.98	26.95
CO ₂ e	1,277,028.65	3,831,085.95	1,624,903.94	4,874,711.81

5.4 Supporting Boiler and Heater Emissions

NPPD will be constructing the following natural gas-fired boilers and heaters to support the operation of the RICE and CTs at PRS.

- ▶ One (1) 99.80 MMBtu/hr Auxiliary Boiler to support the combined cycle operations
- ▶ Two (2) 3.80 MMBtu/hr Dew Point Heaters to heat the natural gas prior to being introduced to the RICE units
- ▶ Four (4) 4.60 MMBtu/hr Dew Point Heaters to heat the natural gas prior to being introduced to the CTs

The boiler and heaters will operate utilizing natural gas only. The hourly PTE is based on the maximum hourly heat inputs and emission factors from AP-42 Section 1.4. Annual emissions are based on the maximum hourly heat input occurring for 8,760 hours per year.

GHG emissions were calculated using 40 CFR Part 98, Subpart C, Table C-1 and C-2 emission factors for natural gas along with global warming potentials from Table A-1 of Part 98.

5.5 Emergency Engine Emissions

NPPD will be constructing the following emergency engines to support operations at the facility in the event of a power outage. The following diesel-fired emergency engines will be installed, and all emergency engines will be EPA Tier 2 certified.

- ▶ One (1) 2,500 kW (3,374 hp) emergency engine to support the CTs
- ▶ Two (2) 882 kW (1,183 hp) emergency engines to support the RICE
- ▶ One (1) 2,500 kW (3,374 hp) emergency engine to support the electric fuel oil island heaters
- ▶ One (1) 235 kW (315 hp) fire pump engine

The hourly PTE is based on the maximum rating of the engines and vendor-provided emissions data sheets. SO₂ emission factors are from AP-42, Chapter 3, Table 3.4 and a fuel sulfur content of 15 ppmv or utilizing a mass balance approach considering the vendor-provided fuel consumption (gal/hr) and a ULSD sulfur content of 15 ppm. The annual PTE is based on the hourly PTE occurring for 500 hours per year. The emissions datasheets for all engines can be found in Appendix B, and the detailed emissions calculations can be found in Appendix C.

5.6 Fuel Oil Storage Tanks

To support fuel oil operation of the RICE and CTs, NPPD proposes to install four (4) 2,000,000-gallon fuel oil storage tanks, that will have working and breathing emissions of VOC. VOC emissions from the storage tanks are based on WebFire working and breathing loss emission factors for diesel fuel storage tanks as well as the storage capacity and maximum throughput of the tanks. Detailed calculations are presented in Appendix C.

5.7 Substation Transformers

PRS is constructing a new substation to accommodate the new PRS. The transformers will contain SF₆ and Trinity has calculated the potential SF₆ emissions based on a leak rate of 0.5% per year. The IEEE standard for SF₆ breakers require a leakage rate of less than 1.0% per year. NPPD includes a requirement in their breaker contracts that limits the SF₆ leakage to 0.5% per year.

5.8 Natural Gas-Fired Space Heaters

NPPD is installing small, natural gas-fired space heaters in four (4) of the PRS buildings, the Power Block Building Heaters (PBBH), the Wastewater Treatment Building Heaters (WTBH), the Urea Building Heaters (UBH), and the Multipurpose Building Heaters (MBH), to provide comfort heat during colder months of the year. The space heaters to be installed are small, commercially available units which range from 0.15 MMBtu/hr to 1.5 MMBtu/hr, and example heater specifications are provided in Appendix B. Due to the number of space heaters that may be required per building and their small size, NPPD calculated emissions using a conservative MMBtu/hr heat input for all heaters in each building, added a 20% safety factor to the conservative total heat input, and assumed that all heaters operate for 8,760 hours per year simultaneously. Detailed PTE calculations for the space heaters using AP-42, Section 1.4 emission factors are provided in Appendix C.

6. PSD AIR QUALITY ANALYSES

This section of the application describes the air quality analyses. As part of PSD review, based on the pollutants which exceed the PSD SERs as shown in Table 1-2, NPPD is required to complete air quality analyses for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, and ozone. The goal of the air quality analyses is to demonstrate that the Princeton Road Station project will not cause or contribute to a violation of the NAAQS or PSD Increments. The NAAQS and PSD Increments are summarized in Table 6-1.

Table 6-1. Summary of NAAQS and PSD Increments

Pollutant	Avg Period	NAAQS ($\mu\text{g}/\text{m}^3$)	Class II Area PSD Increment ($\mu\text{g}/\text{m}^3$)
NO ₂	1-hr	188	None
	Annual	100	25
SO ₂	1-hr	196	None
	3-hr	1300	512
	24-hr	None	91
	Annual	None	20
CO	1-hr	10,000	None
	8-hr	40,000	None
PM _{2.5}	24-hr	35	9
	Annual	9	4
PM ₁₀	24-hr	150	30
	Annual	None	17
Ozone	8-hr	70 ppb	None

This section summarizes the air quality analyses that were conducted to support this PSD permit application and addresses the methods and procedures that were used to demonstrate that the new power generation project does not cause or contribute to violations of the following NAAQS or PSD Class II Increments:

- ▶ Class II Modeling Significance Analysis,
- ▶ Class II National Ambient Air Quality Standards (NAAQS) Analysis, and
- ▶ Class II PSD Increment Analysis.

This section covers the air dispersion modeling of PM₁₀, PM_{2.5}, NO_x, SO₂, and CO using AERMOD. In addition, it covers the following:

- ▶ Review of ozone formation attributable to NO_x and VOC emissions from the new generation using the EPA modeling of hypothetical sources¹⁰⁸,
- ▶ Review of secondary PM_{2.5} formation attributable to NO_x and SO₂ emissions from the new generation using EPA modeling of hypothetical sources.

These PSD Air Quality Analyses have been prepared in accordance with the NDEE's "Ambient Air Impact Analysis Guideline for Performing Stationary Source Air Quality Modeling in Nebraska" (August 2017), and the air quality analyses were conducted considering the following additional guidance documents:

- ▶ *Guideline on Air Quality Models* 40 CFR 51, Appendix W (EPA, Revised, January 17, 2017) (https://www.epa.gov/sites/default/files/2020-09/documents/appw_17.pdf)
- ▶ *User's Guide for the AMS/EPA Regulatory Model – AERMOD* (October 2023) (https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_userguide.pdf)
- ▶ *AERMOD Implementation Guide* (EPA, April 2021)
- ▶ *New Source Review Workshop Manual* (EPA, Draft, October 1990)
- ▶ *Modeling Procedures for Demonstrating Compliance with PM_{2.5} NAAQS* (EPA, Memorandum from Mr. Stephen Page, March 23, 2010)
- ▶ *Draft Guidance for Ozone and Fine Particulate Matter Modeling* (EPA, Memorandum from Mr. Richard A. Wayland, February 10, 2020)
- ▶ *Revised Policy on Exclusions from "Ambient Air"* (EPA, Memorandum from Mr. Andrew R. Wheeler, December 2, 2019)
- ▶ *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier I Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program* (EPA, Memorandum from Mr. Richard A. Wayland, December 2, 2016) and associated errata document (February 2017)
- ▶ *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier I Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program* (EPA, Memorandum from Mr. Richard A. Wayland, April 30, 2019)
- ▶ *Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program* (EPA Memorandum from Mr. Peter Tsirigotis, April 17, 2018)
- ▶ *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard* (EPA, Memorandum from Mr. Tyler Fox, March 1, 2011)
- ▶ *Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO₂ National Ambient Air Quality Standard* (EPA, Memorandum from Mr. R. Chris Owen and Roger Brode, September 30, 2014)
- ▶ *Draft Guidance on Developing Background Concentrations for Use in Modeling Demonstrations* (EPA, October 2023)
- ▶ *Clarification on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program* (EPA Memorandum from Mr. Tyler Fox, April 30, 2024)
- ▶ *Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of the Prevention of Significant Deterioration Program* (EPA Memorandum from Mr. Richard Wayland and Mr. Scott Mathias, April 30, 2024)

6.1 Overview of AERMOD Setup

The AERMOD modeling system was used to predict the concentrations of PM₁₀, primary PM_{2.5}, NO_x, SO₂, and CO. The latest version (v24142) of the AMS/EPA Regulatory Model (AERMOD) model was used to estimate

¹⁰⁸ U.S. EPA, *Guidance for Ozone and Fine Particulate Permit Modeling*, July 29, 2022.

maximum ground-level concentrations in all air pollutant analyses conducted for this application. AERMOD is a refined, steady-state, multiple source, Gaussian dispersion model and is the preferred model for use by industrial sources for this type of air quality analysis.

The AERMOD modeling system is composed of three modular components: AERMAP (v24142), the terrain preprocessor; AERMET (v24142), the meteorological preprocessor; and AERMOD, the control module and modeling processor. AERMAP is the terrain pre-processor that is used to import terrain elevations for selected model objects and to generate the receptor hill height scale data that are used by AERMOD to drive advanced terrain processing algorithms. AERMET generates a separate surface file and vertical profile file to pass meteorological observations and turbulence parameters to AERMOD. AERMET meteorological data are refined for a particular analysis based on the choice of micrometeorological parameters that are linked to the land use and land cover around the facility and/or meteorological site.

The BREEZE®-AERMOD GIS Pro v13.1 software, a graphical user interface, was used to assist in developing the model input files for AERMOD. These software programs incorporate and utilize the most recent U.S. EPA versions of AERMOD, AERMET, and AERMAP to estimate ambient impacts from the modeled sources. Following procedures outlined in the NDEE Modeling Guidelines, the AERMOD modeling was performed using all regulatory default options.

6.1.1 AERMET Meteorological Data

NDEE generated AERMOD-ready meteorological data for the period 2019 - 2023 using U.S. EPA's AERMET meteorological processing utility (version 24142) and provided it to NPPD. Specifically, the 2019-2023 Lincoln Airport National Weather Service (NWS) dataset was used for surface meteorological data along with upper air data from OMX. NPPD utilized this meteorological data provided by NDEE for all air quality analyses completed using AERMOD. Copies of the meteorological data used are provided in the electronically submitted modeling files.

DWEE provided updated AERMOD-ready meteorological data for the period of 2017-2020, and 2022 using the same upper and lower air met stations. NPPD updated the dispersion modeling analysis using this updated met data set, and copies of these updated files are provided in the electronically submitted modeling files.

6.1.2 AERMAP Terrain Elevations and Hill Heights

For all fence line and off-site receptors, existing Sheldon Station sources and buildings, and regional, non-NPPD sources, elevations required by AERMOD are based on 1-Arc Second National Elevation Database (NED) data obtained from the United States Geological Service (USGS). AERMAP (version 18081) was used to extract the elevations from the NED data to import terrain elevations for selected model objects and to generate the receptor hill height scale data that are used by AERMOD to drive advanced terrain processing algorithms. The base/grade elevation of the plant is approximately 420 meters above mean sea level. A copy of the NED file is included in the electronic modeling files.

The new PRS will be graded, levelled, and the base elevation of PRS will be set to 1,390 feet prior to construction of the facility. Therefore, for the PRS sources and buildings, the ground elevation input into AERMOD was set to 1,390 feet.

6.1.3 Coordinate System

The locations of emission sources, structures, and receptors are represented in the Universal Transverse Mercator (UTM) coordinate system. Princeton Road and Sheldon Stations are approximately centered at UTM, Zone 14, coordinates 687 km East and 4,493 km North using North American Datum 1983 (NAD 83).

6.1.4 Receptor Grid

For this air dispersion modeling analysis, ground level concentrations are calculated (by AERMAP, using NED data) at receptors placed along the ambient air boundaries (generally fence lines) and beyond using a Cartesian receptor grid. NDEE's modeling guidance recommends the following spacing¹⁰⁹, and Trinity utilized these spacing requirements for all air quality analyses completed using AERMOD.

- ▶ 50 m along the facility fence line
- ▶ 50 m extending from the fence line to 0.4 km
- ▶ 100 m extending from 0.4 km to 2 km
- ▶ 250 m extending from 2 km to 5 km
- ▶ 500 m extending from 5 km to 7 km
- ▶ 1,000 m extending greater than 7 km

6.1.5 Building Downwash and GEP Stacks Heights

AERMOD incorporates the Plume Rise Model Enhancements (PRIME) downwash algorithms. For these modeling analyses, the direction-specific building dimensions used as input to the AERMOD model were calculated using the *BREEZE®-AIR* software. This software incorporates the algorithms of the U.S. EPA sanctioned Building Profile Input Program, PRIME version (BPIP PRIME, v04274 - Regulatory). BPIP PRIME is designed to incorporate the concepts and procedures expressed in the Good Engineering Practices (GEP) Technical Support document, the Building Downwash Guidance document, and other related documents.¹¹⁰

U.S. EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP height is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the greater of either 65 meters or the height determined by the following formula:

HGEP = H + 1.5L, where:

HGEP = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or projected width).

This equation is limited to stacks located within 5L of a structure. Stacks located at a distance greater than 5L are not subject to the wake effects of the structure. The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP.

¹⁰⁹ NDEE's *Ambient Air Impact Analysis Guideline for Performing Station Source Air Quality Modeling in Nebraska*, page 14

¹¹⁰ U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised)*, Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

NPPD is planning to construct stacks at or below the heights determined to be the GEP heights as further discussed in Section 6.4.

Output from the BPIP PRIME downwash analysis is provided in the electronic files included with this report. The output contains a summary of the dominant structure for each emissions unit and the actual building height and projected widths for all wind directions (in 10-degree increments).

6.1.6 NO_x to NO₂ Modeling Approach

The EPA *Guideline on Air Quality Models* indicates Ambient Ratio Method 2 (ARM2) is the regulatory default Tier 2 NO₂ modeling method. Trinity utilized ARM2 for modeling NO₂ for the 1-hr and annual SIL and NAAQS modeling assessments, and for the annual PSD Increment modeling assessment. ARM2 was utilized for the NO₂ analysis using all regulatory default options per NDEE's modeling guidance¹¹¹.

6.2 Overview of PSD Air Quality Analyses

The purpose of the PSD air quality analyses is to demonstrate that the emissions from power generation at PRS will not cause or contribute to a violation of the NAAQS or Class II PSD Increments. Trinity followed the steps below to make this demonstration.

6.2.1 Load Analysis for RICE and CTs

Trinity initially completed a load analysis for the RICE and CTs to determine the operating load that results in the worst-case air quality impacts when considering the load-specific emissions and stack parameters. The purpose of the load analysis was to determine the steady state emission rate and stack parameters to use in subsequent analyses, as further described in this section. Note that startup and shutdown emissions were not considered in the load analysis.

As discussed in Section 5 of this application, Wartsila and Siemens provided NO_x, CO, and PM emissions estimates for the new RICE and CT units at various loads for both fuel types. SO₂ emissions for the RICE were calculated at the same various loads using the heat input at each load and the sulfur content of both natural gas and fuel oil, as Wartsila did not provide SO₂ emissions estimates. Siemens provided SO₂ emissions data for the CTs for each load directly. In addition to providing emissions estimates, Wartsila and Siemens also provided the exhaust temperature and flow rate for each operating load, fuel type, and in the case of Siemens, various ambient conditions. Therefore, while the PTE calculations described in Section 5 only consider steady state emissions at 100% load (as 100% load is when steady state emissions are the highest), for modeling purposes, it is necessary to determine which combination of emission rate and stack parameters specific to a certain load and ambient condition generates the highest modeled impact¹¹² for each pollutant, modeled averaging period, and fuel type.

Note that the modeled emission rates for the RICE and CTs include startup, shutdown and steady state, as further described below. However, it should be noted that where the 100% load case always produces the highest potential steady state emission rate (see Section 5 for a description of the use of steady state emission in the PTE calculations), the 100% load case does not always result in the highest air quality

¹¹¹ NDEE's *Ambient Air Impact Analysis Guideline for Performing Station Source Air Quality Modeling in Nebraska*, page 11

¹¹² The load analysis considered H1H impacts and established the worst-case load by taking the highest H1H impact from the different load source groups modeled.

impact. Thus, for the parts of the modeling that are intended to consider steady state emissions, the steady state rate should reflect the steady state rate associated with the load that gives the highest air quality impact.

A load analysis was conducted using AERMOD for the RICE units to establish which operating load generates the highest modeled impact for each pollutant, averaging period, and fuel type, and then the emission rate and stack parameters (temperature, flow rate) associated with that load were carried forward through the remainder of the air quality analyses.

- ▶ For the RICE, the load analysis considered four (4) load cases for two (2) fuels. Therefore eight (8) source groups were created based on the load and fuel type, each containing 12 RICE at the specific emission rate and stack parameters associated with that particular load.
- ▶ For the CTs operating in simple cycle, emission rates and stack parameters were provided for multiple operating loads at several ambient conditions. Based on the data provided, the extreme winter (-13.9 F) case has the highest emission rate across the different ambient conditions for each load, and the lowest exhaust flowrate. Therefore, the extreme winter ambient case would always result in the highest modeled impacts when comparing to the other ambient conditions. Therefore, only the extreme winter ambient case was considered in the load analysis. This resulted in six (6) source groups based on the load and fuel type, each containing four (4) CTs operating in simple cycle at the specific emission rate and stack parameters associated with that particular load.
- ▶ For combined cycle operation, emission rates and stack parameters were provided for multiple operating loads at several ambient conditions. Based on the data provided, the extreme winter (-13.9 F) case has the highest emission rate across the different ambient conditions for each load, and the lowest exhaust flowrate. Therefore, the extreme winter ambient case would always result in the highest modeled impacts when comparing to the other ambient conditions. Therefore, only the extreme winter ambient case was considered in the load analysis, and this assumption was confirmed by the vendor. This resulted in six (6) source groups based on the load and fuel type, each containing three (3) CTs operating in a 3x1 combined cycle configuration at the specific emission rate and stack parameters associated with that particular load.

Table 6-2 shows the model inputs for the load analysis for the RICE and CTs.

Table 6-2. Load Analysis Model Inputs

Source ID	Description	NO ₂ Emission Rate (lb/hr)	CO Emission Rate (lb/hr)	PM ₁₀ Emission Rate (lb/hr)	PM _{2.5} Emission Rate (lb/hr)	SO ₂ Emission Rate (lb/hr)	Stack Height (ft) SH	Stack Temp. (F) ST	Flow Rate (acfm) FR	Cross- Sectional Area (ft ²)	Exit Velocity (ft/s) EV	Stack Diameter (in) SD
WR100NG	18 MW Wartsila RICE - 100% Load - NG	3.2000	4.9000	3.9000	3.9000	0.7565	190.00	756.00	120,360.00	19.63	102.16	60.00
WR75NG	18 MW Wartsila RICE - 75% Load - NG	2.5000	4.0000	3.2000	3.2000	0.5674	190.00	820.48	99,237.93	19.63	84.24	60.00
WR50NG	18 MW Wartsila RICE - 50% Load - NG	2.6000	2.7000	3.0000	3.0000	0.3783	190.00	823.97	76,465.25	19.63	64.91	60.00
WR40NG	18 MW Wartsila RICE - 40% Load - NG	2.2000	2.3000	2.8000	2.8000	0.3026	190.00	820.56	64,385.87	19.63	54.65	60.00
WR100FO	18 MW Wartsila RICE - 100% Load - FO	20.1000	7.0000	5.6000	5.6000	0.2100	190.00	577.00	126,720.00	19.63	107.56	60.00
WR75FO	18 MW Wartsila RICE - 75% Load - FO	15.5000	5.3000	4.4000	4.4000	0.1575	190.00	593.00	97,680.00	19.63	82.91	60.00
WR50FO	18 MW Wartsila RICE - 50% Load - FO	12.0000	3.7000	4.4000	4.4000	0.1050	190.00	630.00	72,120.00	19.63	61.22	60.00
WR40FO	18 MW Wartsila RICE - 40% Load - FO	10.1000	3.1000	4.0000	4.0000	0.0840	190.00	680.00	62,160.00	19.63	52.76	60.00
SMSCNG1	Siemens SC NG -Extreme Winter, 100% Load	28.0800	11.4000	10.7000	10.7000	3.7000	190.00	840.00	3,357,492.36	754.77	74.14	372.00
SMSCNG2	Siemens SC NG -Extreme Winter, 75% Load	22.6800	9.2000	8.9000	8.9000	3.0000	190.00	840.00	2,842,080.43	754.77	62.76	372.00
SMSCNG3	Siemens SC NG -Extreme Winter, MECL	15.6000	6.3000	6.8000	6.8000	2.1000	190.00	840.00	2,189,742.34	754.77	48.35	372.00
SMSCFO1	Siemens SC FO -Extreme Winter, 100% Load	45.7000	11.1000	30.0000	30.0000	3.6000	190.00	840.00	3,092,261.31	754.77	68.28	372.00
SMSCFO2	Siemens SC FO -Extreme Winter, 75% Load	37.1000	9.0000	30.0000	30.0000	2.9000	190.00	840.00	2,673,527.89	754.77	59.04	372.00
SMSCFO3	Siemens SC FO -Extreme Winter, MECL	29.5000	7.2000	30.0000	30.0000	2.3000	190.00	840.00	2,303,630.70	754.77	50.87	372.00
SMCCNG1	Siemens CC NG -Extreme Winter, 100% Load	23.2000	11.3000	10.6000	10.6000	3.6000	190.00	193.40	1,284,164.35	346.36	61.79	252.00
SMCCNG2	Siemens CC NG -Extreme Winter, 75% Load	18.8000	9.1000	8.8000	8.8000	3.0000	190.00	183.13	1,047,145.19	346.36	50.39	252.00
SMCCNG3	Siemens CC NG -Extreme Winter, MECL	12.9000	6.3000	6.8000	6.8000	2.0000	190.00	176.47	800,323.79	346.36	38.51	252.00
SMCCFO1	Siemens CC FO -Extreme Winter, 100% Load	45.5000	11.1000	30.0000	30.0000	3.6000	190.00	208.45	1,276,712.77	346.36	61.43	252.00
SMCCFO2	Siemens CC FO -Extreme Winter, 75% Load	37.0000	9.0000	30.0000	30.0000	2.9000	190.00	200.20	1,077,047.19	346.36	51.83	252.00
SMCCFO3	Siemens CC FO -Extreme Winter, MECL	28.6000	7.0000	30.0000	30.0000	2.3000	190.00	193.57	901,866.12	346.36	43.40	252.00

The source group from the above table that had the highest modeled impact for a particular pollutant and averaging period represents the load that is carried forward into the Step 1 and Step 2 Significance, NAAQS, and Increment Analyses discussed below.

Table 6-3 below summarizes the load case with the highest air quality impact for each pollutant and averaging period for the RICE. The electronic modeling files include a separate load analysis modeling file for each pollutant and averaging period.

Table 6-3. RICE Load Analysis Results

Modeled Pollutant and Averaging Period	Worst Case Load - Natural Gas	Worst Case Load - Fuel Oil
NO ₂ 1-Hour	50% Load	100% Load
NO ₂ Annual	50% Load	100% Load
PM _{2.5} 24-hour	100% Load	50% Load
PM _{2.5} Annual	40% Load	50% Load
PM ₁₀ 24-hour	100% Load	100% Load
PM ₁₀ Annual	40% Load	50% Load
CO 1-hour and 8-hour	100% Load	100% Load
SO ₂ 1-hour, 3-hour, and 24-hour	100% Load	100% Load
SO ₂ Annual	100% Load	100% Load

Based on the results of the load analysis shown above, when modeling the RICE firing natural gas, because the combination of the 50% load steady state emission rate and stack parameters generated the highest 1-hr NO₂ modeled impacts (on a H1H basis), the 50% load steady state emission rate would be considered along with startup and shutdown emissions similar to the PTE calculation during development of the modeled emission rate, and the temperature and flow rate associated with the 50% load case would be utilized whenever modeling the RICE firing natural gas against a 1-hr NO₂ standard. However, when modeling the RICE firing natural gas against an annual PM_{2.5} standard, then the 100% load steady state emission rate would be considered and the 100% load exhaust temperature and flowrate would be used.

Table 6-4 shows the load analysis results for the CTs when operating in either simple or combined cycle and firing either fuel.

Table 6-4. CT Load Analysis Results

Modeled Pollutant and Averaging Period	Worst Case Load - Natural Gas Simple Cycle	Worst Case Load - Natural Gas Combined Cycle	Worst Case Load - Fuel Oil Simple Cycle	Worst Case Load - Fuel Oil Combined Cycle
NO ₂ 1-Hour	100% Load	75% Load	100% Load	75% Load
NO ₂ Annual	100% Load	75% Load	100% Load	100% Load
PM _{2.5} 24-hour	MECL	MECL	MECL	MECL
PM _{2.5} Annual	MECL	MECL	MECL	MECL
PM ₁₀ 24-hour	100% Load	MECL	MECL	MECL
PM ₁₀ Annual	MECL	MECL	MECL	MECL
CO 1-hour and 8-hour	100% Load	75% Load	100% Load	100% Load

Modeled Pollutant and Averaging Period	Worst Case Load - Natural Gas Simple Cycle	Worst Case Load - Natural Gas Combined Cycle	Worst Case Load - Fuel Oil Simple Cycle	Worst Case Load - Fuel Oil Combined Cycle
SO ₂ 1-hour, 3-hour, and 24-hour	100% Load	75% Load	100% Load	100% Load
SO ₂ Annual	100% Load	75% Load	100% Load	100% Load

6.2.2 Step 1A – Project Significance Analysis

First, a “Project Significance Analysis” was conducted for all pollutants for which the potential emissions from PRS exceed the PSD significant emission rates (SERs) to determine if the emissions associated with the proposed new generation could cause a significant impact on the area surrounding the facility. The pollutants with potential emissions above the SERs include PM₁₀, PM_{2.5}, NO_x, SO₂, VOC, and CO as shown in Section 2. The Project Significance Analysis also considered ozone, since projects at an existing major source with potential emissions of either NO_x or VOC above 40 tpy are required to evaluate ozone.

A significant impact is a modeled impact that exceeds the significant impact levels (SILs). The SILs are summarized in Table 6-5. In addition to the number value of the SIL, the table also shows the specific statistical form that is relevant in evaluating modeled concentrations against the SILs.

Table 6-5. Class II Area SILs

Pollutant	Averaging Period	PSD Class II SIL (µg/m³)	Form of the SIL¹¹³
NO ₂	1-hr	7.5	Max of the 5-year average of the H1H
	Annual	1.0	Max Annual Impacts from a 5-year met data set
CO	1-hr	2,000	H1H from a 5-year met data set
	8-hr	500	H1H from a 5-year met data set
PM ₁₀	24-hr	5	H1H from a 5-year met data set
	Annual	1	Max Annual Impacts from a 5-year met data set

¹¹³ The form of the SIL is based on the use of a 5-year meteorological record for all pollutants with concentrations predicted using the AERMOD dispersion model. The form of the SIL does not apply to the assessment of the secondary formation of pollutants, such as ozone and secondary PM_{2.5}.

Pollutant	Averaging Period	PSD Class II SIL ($\mu\text{g}/\text{m}^3$)	Form of the SIL ¹¹³
PM _{2.5} ^{114,115}	24-hr	1.2	Highest 5-year avg. of the H1H impacts
	Annual	0.3	High 5-yr avg. of the annual arithmetic mean
Ozone ¹¹⁶	8-hr	1 ppb	8-hr – Based on EPA’s hypothetical modeling to establish MERPS
SO ₂	Annual	1	Max Annual Impacts from a 5-year met data set
	24-hour	5	H1H from a 5-year met data set
	3-hour	25	H1H from a 5-year met data set
	1-hour	7.9	Max of the 5-year average of the H1H

Trinity used a combination of AERMOD modeling and EPA’s modeling of hypothetical sources to predict the air concentrations of certain pollutants due to emissions of those pollutants from the new sources. More specifically, Trinity used AERMOD to predict the impacts of NO₂, SO₂, CO, primary PM₁₀, and primary PM_{2.5}, and Trinity used EPA’s Modeling of Hypothetical Sources (often called the EPA’s modeling of Maximum Emission Rate Precursors or MERPs) to predict the impacts of secondary PM_{2.5} and ozone. For PM_{2.5}, the primary PM_{2.5} impacts from AERMOD were added to the secondary PM_{2.5} impacts determined by the MERPS analysis. The use of both AERMOD and EPA’s modeling of hypothetical sources are further discussed below.

If the concentration of a pollutant resulting from the Project Significance Analysis is less than the SIL, then further analyses are not required for that pollutant. If the concentrations are over the SIL, then an analysis of the cumulative NAAQS and PSD Increment concentrations is required.

6.2.2.1 Modeled Emission Sources – Significance Analysis

For the significance analysis, the new PRS sources are the only emission sources included in the models. These include the following:

- ▶ Twelve (12) 18 MW Wartsila RICE, operating utilizing either natural gas or fuel oil
- ▶ Four (4), 260 MW Siemens Combustion Turbines, operating utilizing either natural gas or fuel oil, with two operating scenarios
 - All four (4) CTs operating in simple cycle

¹¹⁴ EPA promulgated PM_{2.5} SILs, Significant Monitoring Concentrations (SMCs), and PSD Increments on October 20, 2010 [75 FR 64864, PSD for Particulate Matter Less Than 2.5 Micrometers Increments, Significant Impact Levels (SILs) and Significant Monitoring Concentration (SMC); Final Rule]. The SILs and SMCs became effective on December 20, 2010 (i.e., 60 days after the rule was published in the Federal Register) but the U.S. Court of Appeals decision on January 22, 2013 vacated the SMC and remanded the SIL values back to EPA for reconsideration. EPA has provided guidance (August 2016) and a finalized memo (April 2018) which recommended use of a 24-hr PM_{2.5} SIL of 1.2 $\mu\text{g}/\text{m}^3$, and an annual SIL of 0.2 $\mu\text{g}/\text{m}^3$. EPA responded to the vacature of the SMCs by indicating that existing background monitors should be sufficient to fulfill the ambient monitoring requirements for PM_{2.5}. EPA provided updated guidance on April 30, 2024 recommending an updated PM_{2.5} annual SIL of 0.13 $\mu\text{g}/\text{m}^3$ but still but notes that permitting authorities still have the discretion to use an annual SIL of up to 0.3 $\mu\text{g}/\text{m}^3$, which the State of Nebraska has historically used.

¹¹⁵ The modeled impacts compared to the SIL in Table 2-3 consider both primary impacts modeled using AERMOD and the secondary impacts using the Tier I MERPS analysis presented in Section 6.2.2.3.2.

¹¹⁶ Ozone SER is exceeded by virtue of NO_x and VOC emissions exceeding their respective SER.

- Three (3) of the four (4) CTs operating in a 3x1 combined cycle configuration and the fourth CT operating in simple cycle
- ▶ Two (2) natural gas-fired Dew Point Heaters to support the RICE
- ▶ Four (4) natural gas-fired Dew Point Heaters to support the CTs
- ▶ One (1) natural gas-fired Auxiliary Boiler
- ▶ Four (4) diesel-fired Emergency Generators
- ▶ One (1) diesel-fired Fire Pump Engine
- ▶ Natural Gas-Fired Space Heaters

For the significance analysis, source groups were set up to compare each potential operating scenario against the relevant SIL. In all of the source groups below, the six (6) natural gas fired heaters, auxiliary boiler, natural gas space heaters and five (5) emergency engines were included. The source groups are defined by the permutation of fuel type (for both RICE and CTs) and number/operation mode of the CTs. Similar to the PTE, the following eight (8) scenarios were evaluated, and to reiterate, all of these included the PRS heaters, auxiliary boiler, and emergency engines.

- ▶ Scenario #1: Natural Gas – 12 RICE, 3 CTs Operating in Simple Cycle
- ▶ Scenario #2: Natural Gas – 12 RICE, 4 CTs Operating in Simple Cycle
- ▶ Scenario #3: Natural Gas – 12 RICE, 3X1 Combined Cycle
- ▶ Scenario #4: Natural Gas – 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle
- ▶ Scenario #5: Fuel Oil – 12 RICE, 3 CTs Operating in Simple Cycle
- ▶ Scenario #6: Fuel Oil – 12 RICE, 4 CTs Operating in Simple Cycle
- ▶ Scenario #7: Fuel Oil – 12 RICE, 3X1 Combined Cycle
- ▶ Scenario #8: Fuel Oil – 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle

6.2.2.2 Pollutants Modeled Using AERMOD – NO_x, SO₂, CO, PM₁₀, and Primary PM_{2.5}

AERMOD was used to predict the impacts of NO_x, SO₂, CO, primary PM₁₀, and primary PM_{2.5}. Section 6.1 details the AERMOD setup, and the modeled emission units, and their emission rates and physical parameters are detailed in Section 6.3.

6.2.2.3 Pollutants Evaluated Using EPA's Hypothetical Source Modeling

EPA's modeling of hypothetical sources was used to predict the impacts of ozone and secondary PM_{2.5}. Between 2018 and 2024, EPA issued several guidance documents providing frameworks for air agencies and permit applicants to satisfy compliance demonstration requirements for ozone and PM_{2.5} under the PSD program. Additionally, EPA released a clarification on the development of MERPs as a Tier 1 demonstration tool on April 30, 2024. Specifically, the guidance suggests a two-tier approach for addressing single source impacts on these pollutants. The first tier involves the use of relationships between emissions and ambient impacts developed from EPA's modeling of hypothetical sources.

6.2.2.3.1 Ozone

The relationship between precursor emissions was determined using the Adams County, Nebraska hypothetical source as determined from U.S. EPA's MERPS View Qlik.¹¹⁷ NDEE agreed with use of the Adams County hypothetical source in its November 12, 2024 response to NPPD's Modeling Protocol. The Adams County hypothetical source closely matches the project site area due to its rural nature.

¹¹⁷ https://www.epa.gov/scram/merps-view-qlik#Modeled_Impacts

For both the NO_x and VOC comparison, the 3,000 ton/year emission rate, 90-meter-high hypothetical source was used, as 90m is the only stack height available for the 3,000 tpy hypothetical source. The ratio between the modeled ozone air quality impact from the hypothetical source (µg/m³ or ppb) and the NO_x and VOC modeled emission rate from the hypothetical source (tpy) was multiplied by the NO_x and VOC annual emission rate for the project to determine the ozone contribution from NO_x and VOC. The ozone contribution from VOC was added to the ozone concentration from NO_x to determine the total ozone concentration.

As shown in Section 6.4, Ozone impacts for the PRS sources exceed the SIL; therefore, a cumulative ozone analysis was conducted.

6.2.2.3.2 Secondary PM_{2.5}

The relationship between precursor emissions and secondary PM_{2.5} was determined from a hypothetical source in Adams County, similar to the hypothetical source that was used for ozone. Like ozone, the 3,000 ton/year emission rate, 90-meter-high hypothetical source was used for NO_x, and the 500 ton/year emission rate, 10-meter-high hypothetical source will be used for SO₂. The ratio between the modeled PM_{2.5} air quality impact from the hypothetical source (µg/m³ or ppb) and the NO_x modeled emission rate from hypothetical source (tpy) was multiplied by the NO_x annual emission rate for the project to determine the PM_{2.5} contribution from NO_x. Similarly, the ratio between the modeled PM_{2.5} air quality impact from the hypothetical source (µg/m³ or ppb) and the SO₂ modeled emission rate from hypothetical source (tpy) was multiplied by the SO₂ annual emission rate for the project to determine the PM_{2.5} contribution from SO₂. The secondary PM_{2.5} contribution from NO_x was added to the secondary PM_{2.5} concentration from SO₂ to determine the total secondary PM_{2.5} concentration.

The secondary PM_{2.5} impacts were added to the primary PM_{2.5} impacts determined using AERMOD to calculate the total PM_{2.5} impacts. SIL, NAAQS, and Increment results are presented in Section 6.4.

6.2.3 Step 1B – Ambient Monitoring Requirements

In addition to determining whether cumulative modeling is required, the Project Significance Analysis is also used to determine whether an applicant is exempt from ambient monitoring requirements. To determine whether pre-construction monitoring should be considered, the maximum impacts attributable to the proposed project are assessed against Significant Monitoring Concentrations (SMCs).

The applicable SMC for each pollutant and averaging period is shown in Table 6-6.

Table 6-6. PSD Significant Monitoring Concentrations

Pollutant	Averaging Period	Significant Monitoring Concentration (µg/m³)
NO ₂	Annual	14
CO	8-hr	575
PM ₁₀	24-hr	10
PM _{2.5}	24-hr	No Minimum
SO ₂	24-hr	13

Pollutant	Averaging Period	Significant Monitoring Concentration ($\mu\text{g}/\text{m}^3$)
Ozone	8-hr	VOC or NO _x emissions increase > 100 tpy

Note, there is no SMC for PM_{2.5} (or stated another way, the SMC for PM_{2.5} is 0 $\mu\text{g}/\text{m}^3$); therefore, NPPD is required to consider preconstruction monitoring for PM_{2.5} regardless of the impacts predicted by the Project Significance Analysis.

Ozone is a pollutant that warrants special mention with respect to the review of SMCs and pre-construction monitoring requirements. There is no SMC that triggers this review. Rather, an emission increase of over 100 tpy of either NO_x or VOC triggers consideration of pre-construction monitoring for ozone.

NPPD is required to consider pre-construction monitoring for pollutants with impacts above the SMCs. The goal is to obtain representative data to establish background concentrations for use in the NAAQS analyses. NPPD can identify existing representative data or, if none are available, NPPD can conduct monitoring to establish the background concentrations.

NPPD requested exemption from pre-construction monitoring for ozone, PM₁₀, and PM_{2.5}, which are the three (3) pollutants with preliminary project modeled impacts above the SMCs as shown in Section 6.4. On June 28, 2024, NDEE provided a response to NPPD's request for exemption from pre-construction monitoring in which NDEE agreed to waive the pre-construction monitoring requirements for PM₁₀, PM_{2.5}, and ozone, given that existing representative monitoring data are available for this air quality impacts analysis.

6.2.4 Step 2A – Cumulative NAAQS Analysis

NAAQS are the maximum concentration ceilings, measured in terms of total concentration of a pollutant in the atmosphere, which define the "levels of air quality which the U.S. EPA judges are necessary, with an adequate margin of safety, to protect the public health" and that "protect the public welfare from any known or anticipated adverse effects of a pollutant."

The analyses consider the total future air quality by evaluating the existing levels of air quality together with the increase in air concentrations attributable to the new generation. The details of this approach for each pollutant are described below.

Table 6-7 includes a summary of the NAAQS, which are codified under 40 CFR 50. The table also shows the specific statistical form for demonstrating compliance with that NAAQS; that statistical form is relevant in evaluating modeled concentrations.

Table 6-7. Summary of the NAAQS

Pollutant	Averaging Period	Primary and Secondary NAAQS ($\mu\text{g}/\text{m}^3$)
PM ₁₀	24-hr	150 ¹¹⁸
	Annual	--
PM _{2.5}	24-hr	35 ¹¹⁹
	Annual	12 ¹²⁰
NO ₂	1-hr	188 ¹²¹
	Annual	100 ¹²²
CO	1-hr	40,000
	8-hr	10,000
SO ₂	1-hr	196
	3-hr	1,300
Ozone	8-hr	70 ppb ¹²³

6.2.4.1 Modeled Emission Sources – Cumulative NAAQS Analyses

The PRS sources will be included in the cumulative NAAQS analysis along with the existing Sheldon Station sources and Monolith Nebraska sources (only for NO₂), as further described below. Also similar to the Significance Analysis, source groups were set up to evaluate different operating scenarios for the PRS sources. For each of the eight (8) source groups listed below, the only difference between them is the fuel type and number/operation mode of the CTs. The PRS heaters, PRS auxiliary boiler, PRS emergency generators, space heaters, and Sheldon Station sources are included in each one of these source groups/scenarios.

- ▶ Scenario #1: Natural Gas – 12 RICE, 3 CTs Operating in Simple Cycle
- ▶ Scenario #2: Natural Gas – 12 RICE, 4 CTs Operating in Simple Cycle
- ▶ Scenario #3: Natural Gas – 12 RICE, 3X1 Combined Cycle
- ▶ Scenario #4: Natural Gas – 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle
- ▶ Scenario #5: Fuel Oil – 12 RICE, 3 CTs Operating in Simple Cycle
- ▶ Scenario #6: Fuel Oil – 12 RICE, 4 CTs Operating in Simple Cycle
- ▶ Scenario #7: Fuel Oil – 12 RICE, 3X1 Combined Cycle

¹¹⁸ Not to be exceeded more than five (5) times in five (5) consecutive years (highest sixth high modeled output).

¹¹⁹ The 5-year average of the 98th percentile 24-hr average concentration (highest eighth high modeled output).

¹²⁰ The 5-year average of the annual arithmetic average concentration (highest first high modeled output).

¹²¹ The 5-year average of the 98th percentile of the daily maximum 1-hr average (highest eighth high modeled output).

¹²² Annual arithmetic average (highest first high modeled output).

¹²³ Ozone addressed through evaluation of the MERPs.

► Scenario #8: Fuel Oil – 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle

The emission rates and stack parameters for the PRS sources that were included in the cumulative analyses are the same emission rates and stack parameters that were included in the Significance Analysis.

6.2.4.2 Ozone NAAQS Analysis

As shown in Section 6.4, the PRS ozone impacts calculated using a Tier I MERPS analysis are in excess of the ozone SIL; therefore, a cumulative NAAQS analysis is required for ozone. To demonstrate that the proposed project will not cause or contribute to any exceedance of the ozone NAAQS, a cumulative analysis was conducted by summing the ozone concentration attributable to the new generation and the existing background levels of ozone. As shown in Section 6.4, the cumulative analysis demonstrates that the combination of the background concentration and the ozone concentration attributable to new generation remains below the ozone NAAQS.

6.2.4.3 NAAQS Analysis – Pollutants Modeled Using AERMOD

As shown in Section 6.4, modeled impacts from the PRS sources for all CO and SO₂ averaging periods and PM₁₀ annual were below their respective SILs, so no cumulative NAAQS analysis is required for those pollutants/averaging periods.

For NO₂ 1-hour, NO₂ annual, PM_{2.5} 24-hour, PM_{2.5} Annual, and PM₁₀ 24-hour, PRS modeled impacts were in excess of their respective SILs, meaning a cumulative NAAQS analysis is required for these pollutants and averaging periods. For all pollutants modeled using AERMOD, the required cumulative analyses include impacts from the PRS sources, existing Sheldon Station sources, a representative background concentration, and for NO₂ modeling, nearby Monolith Olive Creek 1 sources.

PM_{2.5} is total particulate matter from both primary sources (i.e. direct emissions of PM_{2.5}), and secondary formulation of PM_{2.5} from emissions of other pollutants (NO_x and SO₂). For PM_{2.5} specifically, the cumulative review of both primary and secondary PM_{2.5} impacts along with a representative background concentration is compared to the NAAQS.

For all pollutants for which a cumulative analysis was completed using AERMOD, a description of the model inputs is provided in Section 6.3. This section includes summaries of the modeled emission rates and stack parameters for the PRS sources, the Sheldon Station sources, and the nearby Monolith sources.

6.2.4.4 Background Concentrations

When completing a cumulative NAAQS analysis, background concentrations are relied upon to represent air quality concentrations attributable to sources that are not explicitly modeled (e.g., mobile sources, small but local stationary sources, non-regulated fugitive sources, and large but distant sources). This section describes the background concentrations used in the cumulative NAAQS analyses and added to the modeled impacts shown in Section 6.4.

NPPD proposed background concentrations in the previously submitted modeling protocol, and NDEE provided feedback on recommended background concentrations in a November 12, 2024 response to NPPD. Please see those documents for further details on the proposed background concentrations and NDEE's response.

6.2.4.4.1 Ozone

In the submitted Modeling Protocol, NPPD proposed to use an ozone background concentration of 56 ppb based on 2020-2022 design values from the Davey, NE ambient monitor. In NDEE's November 12, 2024 Protocol Response, NDEE suggested that the 2021-2023 design value for the Davey monitor be used for the ambient background concentration. Therefore, for the cumulative ozone analysis, NPPD used the 2021-2023 Davey, NE monitor design value of **60 ppb** based on 2021-2023 monitored data.

6.2.4.4.2 PM_{2.5}

In the submitted Modeling Protocol, NPPD proposed to use a PM_{2.5} background concentration of 6.2 µg/m³ for the annual standard and 17.4 µg/m³ for the 24-hour standard. Both of these values were based on 2020-2022 monitored data from the Blair, NE ambient monitor. NDEE provided correspondence on September 30, 2024 which indicated that ambient PM_{2.5} background data should be based on monitored data from the Beatrice, NE monitoring site for 2022-2023. This stance was reiterated by NDEE in their November 12, 2024 Protocol Response. Therefore, the cumulative PM_{2.5} analyses utilize background concentrations of **6.2 µg/m³ for the annual standard¹²⁴ and 19.6 µg/m³ for the 24-hour standard**, both based on the 2022-2023 design values for the Beatrice, NE ambient monitor.

6.2.4.4.3 PM₁₀

In NDEE's June 28, 2024 Response to NPPD's Request for Exemption from Pre-Construction Monitoring, page 3 notes: "Currently, NDEE utilizes a default design value of 60 µg/m³ as being a representative background concentration for PM₁₀ for the entire State. Because this concentration is set, NDEE is not requiring NPPD to provide alternative monitoring data". Therefore, NPPD used a background concentration of **60 µg/m³** for the cumulative PM₁₀ analyses. NDEE reiterated their agreement on the use of this concentration for the PM₁₀ background in their November 12, 2024 Protocol Response.

6.2.4.4.4 NO₂

Please see the letter dated November 18, 2025 included in Appendix H for details on the NO₂ background concentration utilized.

6.2.5 Step 2B – PSD Increment Analysis

For any pollutants for which the modeled impacts from the new generation exceed the corresponding significance threshold, a review of the PSD Increment consumption was conducted. PSD Increments are the incremental increases in concentration that are allowed after the pollutant-specific baseline dates. The incremental increases are separate from the NAAQS and generally reflect the allowable change in air quality impacts after a point in time referring to a baseline date.

The PSD Increments and their respective baseline dates are summarized in Table 6-9.

¹²⁴ On page 6 of the September 30, 2024 letter from NDEE, NDEE reiterated use of 6.2 µg/m³ as the acceptable background concentration for the project.

Table 6-8. Summary of PSD Increments and Baseline Dates

Pollutant	Averaging Period	Increment Baseline Date¹²⁵	Class II PSD Increment (µg/m3)
PM ₁₀	24-hr ¹²⁶	November 18, 1977	30
	Annual ¹²⁷		17
PM _{2.5}	24-hr	Set by Submittal of the PSD Application for this Project	9
	Annual		4
NO ₂	1-hr	April 29, 1992	None
	Annual		25

The existing sources at Sheldon Station were constructed well before the baseline dates shown in Table 6-9, and the facility has not installed new emissions sources since the baseline line date, thus the existing sources at Sheldon Station do not consume the PSD Increments and the sources were not included in the Increment modeling runs. Based on the Q/D analysis conducted for NO₂, Monolith Nebraska has a Q/D ratio greater than 20; therefore, Monolith Nebraska should be considered in any cumulative NO₂ analyses. Monolith Nebraska was constructed after April 29, 1992, so all NO₂ sources at Monolith Nebraska consume Increment and were included in the NO₂ Annual analysis based on having a Q/D greater than 20. Therefore, PSD Increment modeling only considered the new PRS sources and the Monolith Nebraska sources (for NO₂ annual only).

6.3 Representation of Emission Sources

This section provides a detailed description of the AERMOD source inputs for the new PRS equipment, the existing Sheldon Station equipment (for required cumulative analyses), and the neighboring Monolith Nebraska equipment (for NO₂ NAAQS and Increment analyses).

Section 8.2.2(c) and Table 8-2 of 40 CFR Part 51, Appendix W states that “for the purposes of demonstrating NAAQS compliance in a PSD assessment, the regulatory modeling of inert pollutants shall use the emissions input data shown in Table 8-2 for short and long-term NAAQS”. Table 8-2 to Appendix W is included below as Table 6-10 for reference during review of the modeled parameters described in this section.

¹²⁵ The baseline date for each pollutant represents the minor source baseline date as summarized in NDEE’s Ambient Air Impact Analysis Guideline for Performing Stationary Source Air Quality Modeling in Nebraska (September 2022).

¹²⁶ Short-term Class II Increments are not to be exceeded more than once per year, therefore the highest-second-high (H2H) impacts from among the five modeled meteorological years will be compared against the short-term Increment for 24-hour averaging periods.

¹²⁷ The highest annual average concentrations will be compared against the annual Increment for all pollutants with an annual averaging period.

Table 6-9. Table 8-2 to Appendix W – Point Source Model Emission Inputs

Table 8-2. - Point Source Model Emission Inputs for NAAQS Compliance in PSD Demonstrations					
Averaging time	Emissions limit (lb/MMBtu) ¹	X	Operating level (MMBtu/hr) ²	X	Operating factor (e.g., hr/yr, hr/day)
Proposed Major New or Modified Source					
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit.		Design capacity or federally enforceable permit condition.		Continuous operation (i.e., 8760 hours). ²
Short term (≤ 24 hours)	Maximum allowable emission limit or federally enforceable permit limit.		Design capacity or federally enforceable permit condition. ³		Continuous operation, i.e., all hours of each time period under consideration (for all hours of the meteorological database). ²
Nearby Source(s) ^{4,5}					
Annual & quarterly	Maximum allowable emission limit or federally enforceable permit limit. ⁵		Annual level when actually operating, averaged over the most recent 2 years. ⁶		Actual operating factor averaged over the most recent 2 years. ^{6,8}
Short term (≤ 24 hours)	Maximum allowable emission limit or federally enforceable permit limit. ⁵		Temporally representative level when actually operating, reflective of the most recent 2 years. ^{6,7}		Continuous operation, i.e., all hours of each time period under consideration (for all hours of the meteorological database). ²
Other Source(s) ^{5,9}					

The ambient impacts from Non-nearby or Other Sources (e.g., natural sources, minor sources and distant major sources, and unidentified sources) can be represented by air quality monitoring data unless adequate data do not exist.

1. Terminology applicable to fuel burning sources; analogous terminology (e.g., lb/throughput) may be used for other types of sources.
2. If operation does not occur for all hours of the time period of consideration (e.g., 3 or 24-hours) and the source operation is constrained by a federally enforceable permit condition, an appropriate adjustment to the modeled emission rate may be made (e.g., if operation is only 8 a.m. to 4 p.m. each day, only these hours will be modeled with emissions from the source. Modeled emissions should not be averaged across non-operating time periods.
3. Operating levels such as 50 percent and 75 percent of capacity should also be modeled to determine the load causing the highest concentration.
4. Includes existing facility to which modification is proposed if the emissions from the existing facility will not be affected by the modification. Otherwise use the same parameters as for major modification.
5. See Section 8.3.3.
6. Unless it is determined that this period is not representative.
7. Temporally representative operating level could be based on Continuous Emissions Monitoring (CEM) data or other information and should be determined through consultation with the appropriate reviewing authority (Paragraph 3.0(b)).
8. For those permitted sources not in operation or that have not established an appropriate factor, continuous operation (i.e., 8760) should be used.
9. See Section 8.3.2.

6.3.1 Princeton Road Station Sources

As described throughout the preceding sections of this application, the power generating units at the new Princeton Road Station will consist of a combination of RICE and CTs which are dual fuel and can operate over a range of operating loads. Princeton Road Station will be located north of the existing Sheldon Station, and a detailed layout can be found in Appendix A. For the RICE and CTs, the modeling is based on the potential emissions, but with consideration given to the results of the load analyses. Instead of using 100% load steady state rates automatically, the RICE and CT modeled emission rates consider the worst-case load (and its corresponding emission rate) based on the load analysis discussed in Section 6.2.1. Detailed model input tables for the PRS sources are presented in this section, which include the stack parameters also identified in the load analysis for each modeled pollutant and averaging period.

6.3.1.1 Princeton Road Station – Source Types

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. The PRS sources, including the RICE, CTs, Heaters, Auxiliary Boiler, and Emergency Engines, were all modeled as point sources.

For dispersion modeling purposes, the natural gas-fired heaters must be included in the PSD air quality analyses. However, due to the small size of the individual heaters and because they do not have a specific exhaust stack, it was not appropriate to model each individual heater as a point source. Therefore, based on the dimensions of the building and the total emissions for all heaters in the building, the Power Block, Wastewater Treatment, Urea, and Multipurpose building space heaters were modeled as volume sources. Modeling these as volume sources is more appropriate, as the heaters will exhaust internally into the building and emissions from the heaters would escape from building openings and not via any exhaust stack. This approach also allows for conservatism in the air quality analyses, as the impacts are not dependent on specific locations for each heater, as they can be moved, and the total heat input for all heaters in the building is likely a conservative overestimate. See the volume source model input table provided for the space heaters in Section 6.3.1.4.

6.3.1.2 Princeton Road Station – Modeled Emission Rates

6.3.1.2.1 RICE and CTs

The calculation tables in Appendix C detail both the PTE calculations and the modeled emission rate calculations. An example of the calculations to determine the emission rate for modeling 1-hr NO₂ is further described below.

Based on the load analysis, the worst-case load for 1-hr NO₂ when the RICE fire natural gas is the 50% load case. Similar to the PTE, an analysis was done to determine which combination of startup (cold, warm, hot), shutdown, and steady state emissions results in the highest hourly emission rate. When calculating the modeled emission rate for 1-hr NO₂ for the RICE firing natural gas, considering the worst-case load of 50%, the maximum emission rate is based on a cold start on natural gas followed by 30 minutes of steady state operation at 50% load (the worst-case load based on the load analysis).

The same analysis that was done for 1-hr NO₂ was done for all pollutants and averaging periods, and the calculation tables in Appendix C detail both the calculated PTE rate as well as the modeled emission rate for each pollutant and averaging period. For extra clarity, the annual PM rates for the RICE are described below. Note that for all averaging periods less than annual, the maximum hourly emission rate was used for all hours of the year in order to evaluate the worst-case emission rate occurring at any hour of the year with the specific meteorological data for that hour.

For the PTE calculations, the PM emissions for the RICE are based on the RICE operating at 100% load year-round. However, because the worst-case load for the RICE firing fuel oil for the PM_{2.5} annual averaging period is 50% load, the modeled emission rate considers 8,760 hours per year of operation at 50% load. As shown in the complete calculation tables in Appendix C, the hourly and annual modeled emission rate for each pollutant and averaging period was calculated considering startup and shutdown emissions for controlled pollutants and the worst-case load established in the load analysis for the steady state portion of those emission rates.

6.3.1.2.2 Heaters, Auxiliary Boiler, Space Heaters, Emergency Engines

For the PRS heaters, auxiliary boiler, space heaters, and emergency engines, the modeled emission rates for any averaging period less than annual are equal to the hourly PTE. For annual averaging periods, the modeled emission rate for the heaters and auxiliary boiler is also equal to the hourly PTE; however, for the emergency engines, the annual average hourly emission rate is utilized, as the emergency engine PTE considers 500 hours per year of operation.

6.3.1.3 Princeton Road Station – Modeled Stack Parameters

Point sources are represented in AERMOD using stack height, stack diameter, exhaust velocity (vertical component only), and exhaust temperature. For point sources with unobstructed vertical releases, it is appropriate to use actual stack parameters (i.e., height, diameter, exhaust gas temperature, and gas exit velocity) in the modeling analysis since the stack heights are below the de minimis GEP height.

6.3.1.3.1 RICE and CTs

Each RICE will exhaust directly into ductwork. The ductwork from six RICE will come together into a steel structure that will support six individual stacks. The stacks will be arranged in two (2) banks of six (6). Each RICE will vent to atmosphere through its own stack. Each stack was modeled at a height of 190 feet, and the stack diameter is based on design information and information from the vendor.

When the CTs are operating in simple cycle, each CT will have a stack specifically for exhausting during simple cycle operation. Each of these “simple cycle stacks” was modeled at a height of 190 feet, and the stack diameter is based on design and vendor information. When the CTs are operating in combined cycle in a 3X1 configuration, the emissions from each CT will exhaust through a HRSG stack. The HRSG stacks were also modeled at 190 feet. The HRSG stack diameters are based on design and vendor information.

The modeled exhaust temperature and flow rate for the RICE and CTs are based on the results of the completed load analysis, and the stack parameters differ for the RICE and CTs based on the specific pollutant and averaging period being modeled. Continuing from the example provided in the modeled emission rate section, because the load analysis for the RICE firing fuel oil for PM_{2.5} annual identified the worst-case load as the 50% load case, the associated exhaust flow rate and temperature from the 50% load case were used as the modeled stack parameters for the RICE when modeling against the PM_{2.5} annual standard. This same approach was used for all pollutants and averaging periods when modeling the RICE and CTs.

6.3.1.3.2 Heaters, Auxiliary Boiler, Emergency Engines

Stack parameters for the heaters, auxiliary boiler, and the emergency engines are based on the expected design of the units or vendor-provided parameters. Note that the emergency engines will be contained in individual enclosures equipped with an exhaust stack with a hinged rain cap that opens when the engine is in operation.

6.3.1.4 Princeton Road Station – Model Input Summary Tables

The following series of tables provides the model inputs for the PRS sources, including all modeled emission rates and stack parameters. Each table represents what was modeled for the PRS sources for each pollutant and averaging period for all significance, NAAQS, and Increment models. Only one individual unit is shown in the tables, but those same parameters were used for all twelve (12) RICE or four (4) CTs for example.

Table 6-10. PRS NO₂ 1-hour Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft)	Stack Temp. (F)	Flow Rate (acfm)	Exit Velocity (ft/s)	Stack Diameter (in)
WARFO	18 MW Wartsila RICE - Fuel Oil	100% Load FO	122.0000	190.00	577.00	126,720.00	107.56	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	100% Load FO	177.6320	190.00	840.00	3,092,261.31	68.28	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	75% Load FO	134.2703	190.00	200.20	1,077,047.19	51.83	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	50% Load NG	21.3000	190.00	823.97	76,465.25	64.91	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	100% Load NG	87.8819	190.00	840.00	3,357,492.36	74.14	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	75% Load NG	102.7246	190.00	183.13	1,047,145.19	50.39	252.00
AUXBOIL	Auxiliary Boiler	N/A	4.8922	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.1863	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.2255	22.00	300.00	1,832.60	14.00	20.00

Table 6-11. PRS NO₂ Annual Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft)	Stack Temp. (F)	Flow Rate (acfm)	Exit Velocity (ft/s)	Stack Diameter (in)
WARFO	18 MW Wartsila RICE - Fuel Oil	100% Load FO	37.5709	190.00	577.00	126,720.00	107.56	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	100% Load FO	60.7607	190.00	840.00	3,092,261.31	68.28	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	100% Load FO	58.2185	190.00	208.45	1,276,712.77	61.43	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	50% Load NG	17.5355	190.00	823.97	76,465.25	64.91	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	100% Load NG	87.8819	190.00	840.00	3,357,492.36	74.14	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	75% Load NG	65.1976	190.00	183.13	1,047,145.19	50.39	252.00
AUXBOIL	Auxiliary Boiler	N/A	4.8922	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.1863	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.2255	22.00	300.00	1,832.60	14.00	20.00
NEWEMER1&2	RICE Diesel Emergency Generator (2 total)	N/A	0.9691	29.50	902.00	5,455.00	166.69	10.00
NEWEMER3	CT Diesel Emergency Generator	N/A	2.5771	29.50	831.10	17,407.00	369.39	12.00
NEWEMER4	Fuel Oil Heaters Emergency Engine	N/A	2.5771	29.50	831.10	17,407.00	369.39	12.00
NEWFIRE	Diesel Fire Pump	N/A	0.0978	29.50	961.00	1,400.00	118.84	6.00

Table 6-12. PRS PM_{2.5} 24-hour Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft) SH	Stack Temp. (F) ST	Flow Rate (acfm) FR	Exit Velocity (ft/s) EV	Stack Diameter (in) SD
WARFO	18 MW Wartsila RICE - Fuel Oil	50% Load FO	4.4000	190.00	630.00	72,120.00	61.22	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	MECL FO	38.0000	190.00	840.00	2,303,630.70	50.87	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	MECL FO	30.3010	190.00	193.57	901,866.12	43.40	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	100% Load NG	3.9000	190.00	756.00	120,360.00	102.16	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	MECL NG	10.1509	190.00	840.00	2,189,742.34	48.35	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	MECL NG	6.8000	190.00	176.47	800,323.79	38.51	252.00
AUXBOIL	Auxiliary Boiler	N/A	0.7436	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.0283	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.0343	22.00	300.00	1,832.60	14.00	20.00
NEWEMER1&2	RICE Diesel Emergency Generator (2 total)	N/A	0.1304	29.50	902.00	5,455.00	166.69	10.00
NEWEMER3	CT Diesel Emergency Generator	N/A	0.2975	29.50	831.10	17,407.00	369.39	12.00
NEWEMER4	Fuel Oil Heaters Emergency Engine	N/A	0.2975	29.50	831.10	17,407.00	369.39	12.00
NEWFIRE	Diesel Fire Pump	N/A	0.0518	29.50	961.00	1,400.00	118.84	6.00

Table 6-13. PRS PM_{2.5} Annual Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft) SH	Stack Temp. (F) ST	Flow Rate (acfm) FR	Exit Velocity (ft/s) EV	Stack Diameter (in) SD
WARFO	18 MW Wartsila RICE - Fuel Oil	50% Load FO	4.4000	190.00	630.00	72,120.00	61.22	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	MECL FO	30.9117	190.00	840.00	2,303,630.70	50.87	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	MECL FO	30.0743	190.00	193.57	901,866.12	43.40	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	40% Load NG	2.8000	190.00	820.56	64,385.87	54.65	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	MECL NG	10.1509	190.00	840.00	2,189,742.34	48.35	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	MECL NG	6.8000	190.00	176.47	800,323.79	38.51	252.00
AUXBOIL	Auxiliary Boiler	N/A	0.7436	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.0283	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.0343	22.00	300.00	1,832.60	14.00	20.00
NEWEMER1&2	RICE Diesel Emergency Generator (2 total)	N/A	0.0074	29.50	902.00	5,455.00	166.69	10.00
NEWEMER3	CT Diesel Emergency Generator	N/A	0.0170	29.50	831.10	17,407.00	369.39	12.00
NEWEMER4	Fuel Oil Heaters Emergency Engine	N/A	0.0170	29.50	831.10	17,407.00	369.39	12.00
NEWFIRE	Diesel Fire Pump	N/A	0.0030	29.50	961.00	1,400.00	118.84	6.00

Table 6-14. PRS PM₁₀ 24-hour Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft) SH	Stack Temp. (F) ST	Flow Rate (acfm) FR	Exit Velocity (ft/s) EV	Stack Diameter (in) SD
WARFO	18 MW Wartsila RICE - Fuel Oil	100% Load FO	5.6000	190.00	577.00	126,720.00	107.56	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	MECL FO	38.0000	190.00	840.00	2,303,630.70	50.87	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	MECL FO	30.3010	190.00	193.57	901,866.12	43.40	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	100% Load NG	3.9000	190.00	756.00	120,360.00	102.16	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	100% Load NG	12.2402	190.00	840.00	3,357,492.36	74.14	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	MECL NG	6.8000	190.00	176.47	800,323.79	38.51	252.00
AUXBOIL	Auxiliary Boiler	N/A	0.7436	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.0283	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.0343	22.00	300.00	1,832.60	14.00	20.00
NEWEMER1&2	RICE Diesel Emergency Generator (2 total)	N/A	0.1304	29.50	902.00	5,455.00	166.69	10.00
NEWEMER3	CT Diesel Emergency Generator	N/A	0.2975	29.50	831.10	17,407.00	369.39	12.00
NEWEMER4	Fuel Oil Heaters Emergency Engine	N/A	0.2975	29.50	831.10	17,407.00	369.39	12.00
NEWFIRE	Diesel Fire Pump	N/A	0.0518	29.50	961	1400	118.84	6.00

Table 6-15. PRS PM₁₀ Annual Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft) SH	Stack Temp. (F) ST	Flow Rate (acfm) FR	Exit Velocity (ft/s) EV	Stack Diameter (in) SD
WARFO	18 MW Wartsila RICE - Fuel Oil	50% Load FO	4.4000	190.00	630.00	72,120.00	61.22	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	MECL FO	30.9117	190.00	840.00	2,303,630.70	50.87	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	MECL FO	30.0743	190.00	193.57	901,866.12	43.40	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	40% Load NG	2.8000	190.00	820.56	64,385.87	54.65	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	MECL NG	10.1509	190.00	840.00	2,189,742.34	48.35	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	MECL NG	6.8000	190.00	176.47	800,323.79	38.51	252.00
AUXBOIL	Auxiliary Boiler	N/A	0.7436	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.0283	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.0343	22.00	300.00	1,832.60	14.00	20.00
NEWEMER1&2	RICE Diesel Emergency Generator (2 total)	N/A	0.0074	29.50	902.00	5,455.00	166.69	10.00
NEWEMER3	CT Diesel Emergency Generator	N/A	0.0170	29.50	831.10	17,407.00	369.39	12.00
NEWEMER4	Fuel Oil Heaters Emergency Engine	N/A	0.0170	29.50	831.10	17,407.00	369.39	12.00
NEWFIRE	Diesel Fire Pump	N/A	0.0030	29.50	961	1400	118.84	6.00

Table 6-16. PRS CO 1-hour and 8-hour Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft) SH	Stack Temp. (F) ST	Flow Rate (acfm) FR	Exit Velocity (ft/s) EV	Stack Diameter (in) SD
WARFO	18 MW Wartsila RICE - Fuel Oil	100% Load FO	12.0000	190.00	577.00	126,720.00	107.56	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	100% Load FO	2,661.6004	190.00	840.00	3,092,261.31	68.28	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	100% Load FO	1,390.8337	190.00	208.45	1,276,712.77	61.43	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	100% Load NG	22.0000	190.00	756.00	120,360.00	102.16	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	100% Load NG	1,019.9034	190.00	840.00	3,357,492.36	74.14	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	75% Load NG	812.3784	190.00	183.13	1,047,145.19	50.39	252.00
AUXBOIL	Auxiliary Boiler	N/A	8.2188	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.3129	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.3788	22.00	300.00	1,832.60	14.00	20.00
NEWEMER1&2	RICE Diesel Emergency Generator (2 total)	N/A	0.8607	29.50	902.00	5,455.00	166.69	10.00
NEWEMER3	CT Diesel Emergency Generator	N/A	4.4630	29.50	831.10	17,407.00	369.39	12.00
NEWEMER4	Fuel Oil Heaters Emergency Engine	N/A	4.4630	29.50	831.10	17,407.00	369.39	12.00
NEWFIRE	Diesel Fire Pump	N/A	0.3107	29.50	961	1400	118.84	6.00

Table 6-17. PRS SO₂ 1-hour, 3-hour, and 8-hour Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft) SH	Stack Temp. (F) ST	Flow Rate (acfm) FR	Exit Velocity (ft/s) EV	Stack Diameter (in) SD
WARFO	18 MW Wartsila RICE - Fuel Oil	100% Load FO	0.2100	190.00	577.00	126,720.00	107.56	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	100% Load FO	3.6000	190.00	840.00	3,092,261.31	68.28	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	100% Load FO	12.4955	190.00	208.45	1,276,712.77	61.43	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	100% Load NG	0.7565	190.00	756.00	120,360.00	102.16	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	100% Load NG	3.7000	190.00	840.00	3,357,492.36	74.14	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	75% Load NG	3.0000	190.00	183.13	1,047,145.19	50.39	252.00
AUXBOIL	Auxiliary Boiler	N/A	0.0587	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.0022	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.0027	22.00	300.00	1,832.60	14.00	20.00
NEWEMER1&2	RICE Diesel Emergency Generator (2 total)	N/A	0.0111	29.50	902.00	5,455.00	166.69	10.00
NEWEMER3	CT Diesel Emergency Generator	N/A	0.0409	29.50	831.10	17,407.00	369.39	12.00
NEWEMER4	Fuel Oil Heaters Emergency Engine	N/A	0.0409	29.50	831.10	17,407.00	369.39	12.00
NEWFIRE	Diesel Fire Pump	N/A	0.0038	29.50	961	1400	118.84	6.00

Table 6-18. PRS SO₂ Annual Model Inputs

Source ID	Description	Load Case	Emission Rate (lb/hr)	Stack Height (ft) SH	Stack Temp. (F) ST	Flow Rate (acfm) FR	Exit Velocity (ft/s) EV	Stack Diameter (in) SD
WARFO	18 MW Wartsila RICE - Fuel Oil	100% Load FO	0.2100	190.00	577.00	126,720.00	107.56	60.00
SMSCFO	Siemens Simple Cycle CT - Fuel Oil	100% Load FO	3.6000	190.00	840.00	3,092,261.31	68.28	372.00
SM3CCFO	Siemens 3x1 Combined Cycle CT - Fuel Oil	100% Load FO	5.4168	190.00	208.45	1,276,712.77	61.43	252.00
WARNG	18 MW Wartsila RICE - Natural Gas	100% Load NG	0.7565	190.00	756.00	120,360.00	102.16	60.00
SMSCNG	Siemens Simple Cycle CT - Natural Gas	100% Load NG	3.7000	190.00	840.00	3,357,492.36	74.14	372.00
SM3CCNG	Siemens 3x1 Combined Cycle CT - Natural Gas	75% Load NG	3.0000	190.00	183.13	1,047,145.19	50.39	252.00
AUXBOIL	Auxiliary Boiler	N/A	0.0587	100.00	300.00	21,205.75	50.00	36.00
DPHRICE	RICE Dew Point Heater (x2)	N/A	0.0022	22.00	300.00	1,832.60	14.00	20.00
DPHCT	CT Dew Point Heater (x4)	N/A	0.0027	22.00	300.00	1,832.60	14.00	20.00
NEWEMER1&2	RICE Diesel Emergency Generator (2 total)	N/A	0.0006	29.50	902.00	5,455.00	166.69	10.00
NEWEMER3	CT Diesel Emergency Generator	N/A	0.0023	29.50	831.10	17,407.00	369.39	12.00
NEWEMER4	Fuel Oil Heaters Emergency Engine	N/A	0.0023	29.50	831.10	17,407.00	369.39	12.00
NEWFIRE	Diesel Fire Pump	N/A	0.0002	29.50	961	1400	118.84	6.00

Table 6-19. PRS Volume Source Model Inputs

ID	Description	X Coordinate (m)	Y Coordinate (m)	NO₂ Emission Rate (lb/hr)	PM_{2.5} Emission Rate (lb/hr)	PM₁₀ Emission Rate (lb/hr)	CO Emission Rate (lb/hr)	SO₂ Emission Rate (lb/hr)	Release Height (ft)	Initial Lateral Dimension (ft)	Initial Vertical Dimension (ft)
VPBBHA	Power Block Building Space Heaters Vol. Source #1	687,635.15	4,493,354.23	0.158	0.012	0.012	0.132	0.001	25.00	50.61	23.26
VPBBHB	Power Block Building Space Heaters Vol. Source #2	687,665.50	4,493,355.46	0.158	0.012	0.012	0.132	0.001	25.00	50.61	23.26
VPBBHC	Power Block Building Space Heaters Vol. Source #3	687,695.85	4,493,356.70	0.158	0.012	0.012	0.132	0.001	25.00	50.61	23.26
VPBBHD	Power Block Building Space Heaters Vol. Source #4	687,726.20	4,493,357.94	0.158	0.012	0.012	0.132	0.001	25.00	50.61	23.26
VPBBHE	Power Block Building Space Heaters Vol. Source #5	687,756.55	4,493,359.17	0.158	0.012	0.012	0.132	0.001	25.00	50.61	23.26
VWTBH	Water Treatment Building Space Heaters Vol. Source #1	687,364.99	4,493,551.12	1.200	0.091	0.091	1.008	0.007	15.00	45.37	13.95
VUBHA	Urea Building Space Heaters Vol. Source #1	687,513.77	4,493,482.64	0.069	0.005	0.005	0.058	0.000	10.00	29.21	9.30
VUBHB	Urea Building Space Heaters Vol. Source #2	687,530.05	4,493,483.25	0.069	0.005	0.005	0.058	0.000	10.00	29.21	9.30
VUBHC	Urea Building Space Heaters Vol. Source #3	687,546.33	4,493,483.86	0.069	0.005	0.005	0.058	0.000	10.00	29.21	9.30
VMBH	Multipurpose Building Space Heaters Vol. Source #1	687,840.83	4,493,343.85	0.441	0.034	0.034	0.371	0.003	15.00	42.16	13.95

Copies of the model input tables are also available Appendix C.

6.3.2 Existing Sheldon Station Sources

For the cumulative NAAQS analyses for NO₂ 1-hour, NO₂ annual, PM_{2.5} 24-hour, PM_{2.5} annual, and PM₁₀ 24-hour, the emission sources at the existing Sheldon Station are required to be included. These include the following sources.

- ▶ EP1 - Unit 1 Boiler (Stack)
- ▶ EP2 - Unit 2 Boiler (Stack)
- ▶ EP3 - Unit 3 – Hallam CT Unit A (Stack)
- ▶ EP4 - Unit 4 – Hallam CT Unit B (Stack)
- ▶ EP5 - Unit 5 – Auxiliary Boiler #1 (Stack)
- ▶ EP6 - Unit 6 – Auxiliary Boiler #2 (Stack)
- ▶ EP11 – Track Hopper Building, Unloading (Material Transfer Building Fugitive)
- ▶ EP12 – Track Hopper to Belt Conveyor #1, Transfer (Material Transfer Building Fugitive)
- ▶ EP13 – Belt Conveyor #1 to Belt Conveyor #2, Transfer (Material Transfer Building Fugitive)
- ▶ EP14 – Belt Conveyor #2 to Active Coal Pile (Material Transfer Open Fugitive)
- ▶ EP14a – Low-BTU Coal Pile to Reclaim Hopper #1-4, Transfer (Underground – no emissions)
- ▶ EP15 – Reclaim Hoppers #1-4 to Belt Conveyor #3, Transfer (Material Transfer Building Fugitive)
- ▶ EP16 – High BTU Coal Pile to Reclaim Hopper #5, Transfer (Underground – no emissions)
- ▶ EP17 – Reclaim Hopper #5 to Belt Conveyor #6, Transfer (Material Transfer Building Fugitive)
- ▶ EP18 – Belt Conveyor #6 to Crusher House, Transfer (Material Transfer Building Fugitive)
- ▶ EP19 – Belt Conveyor #3 to Crusher House, Transfer (Material Transfer Building Fugitive)
- ▶ EP20 – Crusher House, Crushing (Material Transfer Building Fugitive)
- ▶ EP21 – Crusher House to Belt Conveyor #4, Transfer (Material Transfer Building Fugitive)
- ▶ EP22 – Belt Conveyor #4 to Belt Conveyor #5, Transfer (Material Transfer Building Fugitive)
- ▶ EP23 – Belt Conveyor #5 to Boiler #1 Coal Silos (via belt tripper), Transfer (Building Fugitive)
- ▶ EP24 – Belt Conveyor #5 to Boiler #2 Coal Silos (via belt tripper), Transfer (Building Fugitive)
- ▶ EP27 – Fly Ash from Boilers to Silo (Fugitive)
- ▶ EP27a, b, c – Fly Ash Handling Pumps (Material Transfer Building Fugitive)
- ▶ EP27d – Fly Ash Wet Mixer System (Material Transfer Building Fugitive)
- ▶ EP28 – Fly Ash from Silo and Precipitator to Truck (Material Transfer Building Fugitive)
- ▶ EP29 – Fly/Bottom Ash from Truck to Ash Landfill (Material Transfer Open Fugitive)
- ▶ EP29b – Bottom Ash from Ash Landfill to Customer Truck (Material Transfer Open Fugitive)
- ▶ EP30 – Coal Storage Pile (live) (Storage Pile Fugitive)
- ▶ EP31 – Coal Storage Pile (standby) (Storage Pile Fugitive)
- ▶ EP32a – Ash landfill – Bottom ash wind erosion (Fugitive)
- ▶ EP32b – Ash Landfill – Grading of fly ash/precip ash (Fugitive)
- ▶ EP33 – Unpaved Haul Roads (Fugitive)
- ▶ EP34 – Paved Haul Roads (Fugitive)
- ▶ EP43 – Cooling Tower #1 (Stack for each fan)
- ▶ EP44 – Cooling Tower #2 (Stack for each fan)
- ▶ EP46 – Air Compressor (vents to the stack for the Emergency Generator)
- ▶ EP47 – Emergency Generator (Stack)
- ▶ EP48 – Fire Pump #1 (Stack)
- ▶ EP49 – Fire Pump #2 (Stack)

Appendix C includes detailed model input tables for all of the sources venting through stacks as well as the fugitive sources. Calculations are also included to show the derivation of all modeled emission rates.

6.3.2.1 Sources Venting Through Stacks

The emission sources that vent to atmosphere through a stack are characterized as point sources in AERMOD. The emission rates for the short-term averaging periods (24-hours and less) for all sources and pollutants, other than the NO_x and SO₂ from the coal fired boilers, reflect the potential emission rates. The NO_x and SO₂ short-term emissions from the coal-fired boilers are based on the hourly emissions from the CEMS as reported by NPPD to the EPA's Clean Air Markets Program Data (CAMPD) system. Trinity has downloaded the hourly emission rates for 2019 – 2023, the same date range as the meteorological data.

The emission rates for the annual averaging period for all sources and pollutants other than the NO_x and SO₂ from the coal fired boilers reflect the average of the 2022 and 2023 annual emission rates from submitted emissions inventories. The NO_x and SO₂ from the coal-fired boilers is based on the same hourly emissions from the CEMS data that are used in the short-term NO₂ and SO₂ modeling.

Stack parameters for all of the sources venting through stacks are also included in detailed model input tables in Appendix C.

6.3.2.2 Fugitive Dust

The fugitive emission sources are grouped into the following categories:

- ▶ Material transfers,
- ▶ Wind erosion of coal storage piles,
- ▶ Grading and erosion of ash landfill, and
- ▶ Haul Roads.

The fugitive dust sources are characterized as volume sources in AERMOD. A volume source is required to have an emission rate as well as a released height, initial lateral dimension, and initial vertical dimension. Table 3-3 of the October 2023 AERMOD Users guide provides suggested procedures for estimating the initial lateral and vertical dimensions for various types of volume sources. A copy of the AERMOD table for volume source inputs is included as Figure 6-1 below.

Figure 6-1. EPA's Procedures for Estimating the Initial Vertical and Lateral Dimensions of Volume Sources

Type of Source	Procedure for Obtaining Initial Dimension	
(a) Initial Lateral Dimension (σ_{y0})		
Single Volume Source	$\sigma_{y0} =$	length of side divided by 4.3
Line Source Represented by Adjacent Volume Sources (see Figure 1-8 (a) in EPA, 1995a)	$\sigma_{y0} =$	length of side divided by 2.15
Line Source Represented by Separated Volume Sources (see Figure 1-8(b) in EPA, 1995a)	$\sigma_{y0} =$	center to center distance divided by 2.15
(b) Initial Vertical Dimension (σ_{z0})		
Surface-Based Source ($h_e \sim 0$)	$\sigma_{z0} =$	vertical dimension of source divided by 2.15
Elevated Source ($h_e > 0$) on or Adjacent to a Building	$\sigma_{z0} =$	building height divided by 2.15
Elevated Source ($h_e > 0$) not on or Adjacent to a Building	$\sigma_{z0} =$	vertical dimension of source divided by 4.3

Details on the modeled emission rates and release parameters for all fugitive sources can be found in tables in Appendix C.

6.3.2.2.1 Material Transfers – On or Near Buildings/Structures

Trinity followed the procedures in Figure 6-1 to estimate the initial lateral and vertical dimensions for material transfers. Many of the transfers take place inside buildings (such as the Crusher House) or inside structures (such as the Railcar Unloading Bay) and the emissions vent to atmosphere through building vents or structure openings. The emissions leaving the building opening or vents will become entrained in cavity regions created as wind flows over the buildings and structures. Thus, the volume source dimensions are primarily defined by the building dimensions.

The emission rates for these sources for the short-term model runs reflect the potential emission rates. The emission rates for the annual averaging period reflect the average of the reported 2022 and 2023 annual emission rates.

6.3.2.2.2 Material Transfers – Loadout to Pile, Landfill, or Customer Truck

Trinity followed the procedures in Figure 6-1 to estimate the initial lateral and vertical dimensions for the following:

- ▶ Transfer of coal from the belt conveyor to the coal storage pile via a telescopic unloading chute
- ▶ Dumping of coal ash from the ash truck into the ash landfill
- ▶ Transfer of bottom ash from the landfill storage location to the customer truck via a front-end loader

The emission rates for these sources for the short-term model runs reflect the potential emission rates. The emission rates for the annual averaging period reflect the average of the 2022 and 2023 annual emission rates.

6.3.2.2.3 Wind Erosion of Bottom Ash Pile

NPPD followed the procedures in Figure 6-1 to estimate the initial lateral and vertical dimensions for the wind erosion of the bottom ash storage pile. The emission rates for the short-term models reflect the potential emission rates. The emission rates for the annual averaging period reflect the average of the reported 2022 and 2023 annual emission rates.

6.3.2.2.4 Grading of the Landfill

NPPD followed the procedures in Figure 6-1 to estimate the initial lateral and vertical dimensions for the grading of the landfill. The emission rates for the short-term models reflect the potential emission rates. The emission rates for the annual averaging period reflect the average of the reported 2022 and 2023 annual emission rates.

6.3.2.2.5 Haul Roads

NPPD followed the procedures in Figure 6-1 to estimate the initial lateral and vertical dimensions for the volume or area sources representing each segment of the roadways that will be located along the length of the haul routes. The emission rates for the short-term models reflect the potential emission rates. The emission rates for the annual averaging period reflect the average of the reported 2022 and 2023 annual emission rates.

6.3.3 Monolith Nebraska Sources

NDEE provided feedback indicating that the 20D policy (North Carolina, 1985) should be used to determine which regional sources need to be included in the cumulative analyses, and this rule specifies that if the ratio of annual emissions (in tons/year) from the regional source divided by the distance of the regional source to Sheldon Station (in km) is greater than 20, then that regional source should be included.

Trinity compiled a list of all the regional sources within 50 km of Sheldon Station that submit annual emissions inventories to NDEE and a separate list of all the regional sources within 50 km of Sheldon Station that submit annual emission inventories to LLCHD. Once the lists of all sources within 50 km were compiled, Trinity pulled publicly available 2023 emissions data for each source which reports to NDEE, and LLCHD provided 2023 emissions data for each source under their jurisdiction. Note that a large number of sources within 50 km are either not required to submit an annual emissions inventory or they do not emit certain pollutants.

As shown in the submitted Modeling Protocol, for PM_{2.5} and PM₁₀, no sources within 50 km of Sheldon Station had a ratio of emissions to distance greater than 20, thus, based on the 20D policy, no regional sources were included in the PM_{2.5} or PM₁₀ NAAQS or Increment analyses.

For NO₂, Monolith Nebraska was the only source with a Q/D ratio greater than 20; therefore, it was included as a regional source in the cumulative NO₂ NAAQS and Increment analyses. The Monolith OC1 Table in Appendix C summarizes the modeled emission rates and stack parameters for the existing Monolith OC1 sources, which were obtained from an air construction permit application submitted to LLCHD in July 2024. Note that the emission rates for the Monolith OC1 sources were conservatively set equal to potential emission rates.

6.4 Modeling Results

6.4.1 Significance Analysis Results

The following tables provide the modeled results from all the Significance Analysis model runs conducted to compare the modeled impact of the new PRS sources against the SILs. As shown in the Tables, CO and SO₂ are not significant for any averaging period; therefore, no cumulative analyses are required for CO and SO₂. The results of the Tier I MERPS analysis are provided in the cumulative NAAQS results section.

Table 6-20. NO₂ 1-hour SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	SIL (µg/m ³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	NO ₂	1-hr	2017-2020, 2022	134.59	7.5	No
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	NO ₂	1-hr	2017-2020, 2022	188.24	7.5	No
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	NO ₂	1-hr	2017-2020, 2022	134.60	7.5	No
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	NO ₂	1-hr	2017-2020, 2022	188.26	7.5	No
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	NO ₂	1-hr	2017-2020, 2022	134.54	7.5	No
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	NO ₂	1-hr	2017-2020, 2022	196.52	7.5	No
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	NO ₂	1-hr	2017-2020, 2022	134.56	7.5	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	NO ₂	1-hr	2017-2020, 2022	196.54	7.5	No

Table 6-21. NO₂ Annual SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	NO ₂	Annual	2017	8.15	1	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	NO ₂	Annual	2018	8.11	1	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	NO ₂	Annual	2019	7.27	1	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	NO ₂	Annual	2020	7.89	1	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	NO ₂	Annual	2022	8.52	1	No

Table 6-22. PM_{2.5} 24-hour SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	SIL (µg/m ³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	PM _{2.5}	24-hr	2017-2020, 2022	3.89	1.2	No
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2017-2020, 2022	4.43	1.2	No
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	PM _{2.5}	24-hr	2017-2020, 2022	3.90	1.2	No
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2017-2020, 2022	4.45	1.2	No
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	PM _{2.5}	24-hr	2017-2020, 2022	3.98	1.2	No
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2017-2020, 2022	5.91	1.2	No
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	PM _{2.5}	24-hr	2017-2020, 2022	3.99	1.2	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2017-2020, 2022	5.96	1.2	No

Table 6-23. PM_{2.5} Annual SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	PM _{2.5}	Annual	2017-2020, 2022	0.75	0.3	No
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2017-2020, 2022	0.78	0.3	No
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	PM _{2.5}	Annual	2017-2020, 2022	0.75	0.3	No
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2017-2020, 2022	0.78	0.3	No
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	PM _{2.5}	Annual	2017-2020, 2022	0.76	0.3	No
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2017-2020, 2022	0.98	0.3	No
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	PM _{2.5}	Annual	2017-2020, 2022	0.76	0.3	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2017-2020, 2022	0.99	0.3	No

Table 6-24. PM₁₀ 24-hour SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	PM ₁₀	24-hr	2017-2020, 2022	6.19	5	No
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2017-2020, 2022	6.20	5	No
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	PM ₁₀	24-hr	2017-2020, 2022	6.19	5	No
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2017-2020, 2022	6.20	5	No
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	PM ₁₀	24-hr	2017-2020, 2022	6.19	5	No
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2017-2020, 2022	7.03	5	No
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	PM ₁₀	24-hr	2017-2020, 2022	6.19	5	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2017-2020, 2022	7.18	5	No

Table 6-25. PM₁₀ Annual SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	Annual	2017	0.98	1	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	Annual	2018	1.01	1	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	Annual	2019	0.91	1	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	Annual	2020	1.03	1	No
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	Annual	2022	1.05	1	No

Table 6-26. CO 1-hour SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	CO	1-hr	2017-2020, 2022	190.68	2,000	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	CO	1-hr	2017-2020, 2022	426.74	2,000	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	CO	1-hr	2017-2020, 2022	229.19	2,000	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	CO	1-hr	2017-2020, 2022	559.22	2,000	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	CO	1-hr	2017-2020, 2022	482.97	2,000	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	CO	1-hr	2017-2020, 2022	571.47	2,000	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	CO	1-hr	2017-2020, 2022	483.50	2,000	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	CO	1-hr	2017-2020, 2022	574.45	2,000	Yes

Table 6-27. CO 8-hour SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m³)	SIL (µg/m³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	CO	8-hr	2017-2020, 2022	97.09	500	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	CO	8-hr	2017-2020, 2022	178.44	500	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	CO	8-hr	2017-2020, 2022	106.97	500	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	CO	8-hr	2017-2020, 2022	218.99	500	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	CO	8-hr	2017-2020, 2022	209.15	500	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	CO	8-hr	2017-2020, 2022	275.72	500	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	CO	8-hr	2017-2020, 2022	218.01	500	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	CO	8-hr	2017-2020, 2022	306.69	500	Yes

Table 6-28. SO₂ 1-hour SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	SIL (µg/m ³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	SO ₂	1-hr	2017-2020, 2022	3.26	7.8	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	SO ₂	1-hr	2017-2020, 2022	1.48	7.8	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	SO ₂	1-hr	2017-2020, 2022	3.26	7.8	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	SO ₂	1-hr	2017-2020, 2022	1.48	7.8	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	SO ₂	1-hr	2017-2020, 2022	4.34	7.8	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	SO ₂	1-hr	2017-2020, 2022	5.39	7.8	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	SO ₂	1-hr	2017-2020, 2022	4.34	7.8	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	SO ₂	1-hr	2017-2020, 2022	5.40	7.8	Yes

Table 6-29. SO₂ 3-hour SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	SIL (µg/m ³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	SO ₂	3-hr	2017-2020, 2022	1.65	25	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	SO ₂	3-hr	2017-2020, 2022	1.37	25	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	SO ₂	3-hr	2017-2020, 2022	1.66	25	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	SO ₂	3-hr	2017-2020, 2022	1.37	25	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	SO ₂	3-hr	2017-2020, 2022	2.18	25	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	SO ₂	3-hr	2017-2020, 2022	3.16	25	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	SO ₂	3-hr	2017-2020, 2022	2.19	25	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	SO ₂	3-hr	2017-2020, 2022	3.25	25	Yes

Table 6-30. SO₂ 24-hour SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	SIL (µg/m ³)	Below SIL?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources	SO ₂	24-hr	2017-2020, 2022	0.66	5	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources	SO ₂	24-hr	2017-2020, 2022	0.53	5	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources	SO ₂	24-hr	2017-2020, 2022	0.66	5	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources	SO ₂	24-hr	2017-2020, 2022	0.53	5	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources	SO ₂	24-hr	2017-2020, 2022	0.80	5	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources	SO ₂	24-hr	2017-2020, 2022	1.12	5	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	SO ₂	24-hr	2017-2020, 2022	0.80	5	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	SO ₂	24-hr	2017-2020, 2022	1.13	5	Yes

Table 6-31. SO₂ Annual SIL Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	SIL (µg/m ³)	Below SIL?
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	SO ₂	Annual	2017	0.10	1	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	SO ₂	Annual	2018	0.10	1	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	SO ₂	Annual	2019	0.09	1	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	SO ₂	Annual	2020	0.10	1	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources	SO ₂	Annual	2022	0.11	1	Yes

6.4.2 Cumulative NAAQS Modeling Results

6.4.2.1 Ozone and Secondary PM_{2.5}

As discussed in Section 6.2, a Tier I MERPS analysis was completed in order to determine the ozone and secondary PM_{2.5} impacts from PRS. As shown in the ozone results, ozone impacts from PRS exceed the significant impact level for ozone due to the NO_x and VOC PTE; therefore, the impacts for each scenario were added to a representative background concentration and compared against the ozone NAAQS. As the results show, cumulative impacts are below the ozone NAAQS. The secondary PM_{2.5} impacts were added to the primary PM_{2.5} modeled impacts and a background concentration and compared against the PM_{2.5} 24-hour and annual NAAQS.

Table 6-32. Ozone Tier I MERPS Analysis Results

Adams County Hypothetical Source Stack Height:			90 m
Adams County Hypothetical Source NOx Emissions:			3,000 tpy
Adams County Hypothetical Source VOC Emissions:			3,000 tpy
Adams County Hypothetical Source Ozone Impact due to NOx			2,463 ppb
Adams County Hypothetical Source Ozone Impact due to VOC			2,813 ppb

Scenario Description	NOx (tpy)	VOC (tpy)	Ozone Project Impact (ppb)	Ozone Background Concentration (ppb)	Ozone Cumulative Impact (ppb)	Ozone NAAQS (ppb)	Below NAAQS?
Scenario #1 - Natural Gas - 12 RICE, 3 CTs Operating in Simple Cycle:	2,146.55	1,602.84	3.27	60	63.27	70	YES
Scenario #2 - Natural Gas - 12 RICE, 4 CTs Operating in Simple Cycle:	2,531.47	2,049.84	4.00	60	64.00	70	YES
Scenario #3 - Natural Gas - 12 RICE, 3X1 Combined Cycle:	1,848.48	1,479.34	2.90	60	62.90	70	YES
Scenario #4 - Natural Gas - 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle:	2,233.40	1,926.35	3.64	60	63.64	70	YES
Scenario #1 - Fuel Oil - 12 RICE, 3 CTs Operating in Simple Cycle:	2,843.24	1,089.32	3.36	60	63.36	70	YES
Scenario #2 - Fuel Oil - 12 RICE, 4 CTs Operating in Simple Cycle:	3,109.37	1,309.08	3.78	60	63.78	70	YES
Scenario #3 - Fuel Oil - 12 RICE, 3X1 Combined Cycle:	2,809.84	957.30	3.20	60	63.20	70	YES
Scenario #4 - Fuel Oil - 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle:	3,075.97	1,177.07	3.63	60	63.63	70	YES

Table 6-33. Secondary PM_{2.5} Tier I MERPS Analysis Results

Adams County Hypothetical Source Stack Height:	90 m		
Adams County Hypothetical Source NOx Emissions:	3,000 tpy		
Adams County Hypothetical Source SO ₂ Emissions:	500 tpy		
Adams County Hypothetical Source Secondary PM _{2.5} 24-hour Impact due to NOx Emissions:	0.762 ug/m3		
Adams County Hypothetical Source Secondary PM _{2.5} Annual Impact due to NOx Emissions:	0.025 ug/m3		
Adams County Hypothetical Source Secondary PM _{2.5} 24-hour Impact due to SO ₂ Emissions:	1.836 ug/m3		
Adams County Hypothetical Source Secondary PM _{2.5} Annual Impact due to SO ₂ Emissions:	0.037 ug/m3		

Scenario Description	NOx (tpy)	SO ₂ (tpy)	Secondary PM _{2.5} 24-hour Project Impact (ug/m ³)
Scenario #1 - Natural Gas - 12 RICE, 3 CTs Operating in Simple Cycle:	2,146.55	88.80	0.87
Scenario #2 - Natural Gas - 12 RICE, 4 CTs Operating in Simple Cycle:	2,531.47	105.01	1.03
Scenario #3 - Natural Gas - 12 RICE, 3X1 Combined Cycle:	1,848.48	87.49	0.79
Scenario #4 - Natural Gas - 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle:	2,233.40	103.69	0.95
Scenario #1 - Fuel Oil - 12 RICE, 3 CTs Operating in Simple Cycle:	2,843.24	58.76	0.94
Scenario #2 - Fuel Oil - 12 RICE, 4 CTs Operating in Simple Cycle:	3,109.37	74.53	1.06
Scenario #3 - Fuel Oil - 12 RICE, 3X1 Combined Cycle:	2,809.84	82.63	1.02
Scenario #4 - Fuel Oil - 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle:	3,075.97	98.40	1.14

Scenario Description	NOx (tpy)	SO ₂ (tpy)	Secondary PM _{2.5} Annual Project Impact (ug/m ³)
Scenario #1 - Natural Gas - 12 RICE, 3 CTs Operating in Simple Cycle:	2,146.55	88.80	0.02
Scenario #2 - Natural Gas - 12 RICE, 4 CTs Operating in Simple Cycle:	2,531.47	105.01	0.03
Scenario #3 - Natural Gas - 12 RICE, 3X1 Combined Cycle:	1,848.48	87.49	0.02
Scenario #4 - Natural Gas - 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle:	2,233.40	103.69	0.03
Scenario #1 - Fuel Oil - 12 RICE, 3 CTs Operating in Simple Cycle:	2,843.24	58.76	0.03
Scenario #2 - Fuel Oil - 12 RICE, 4 CTs Operating in Simple Cycle:	3,109.37	74.53	0.03
Scenario #3 - Fuel Oil - 12 RICE, 3X1 Combined Cycle:	2,809.84	82.63	0.03
Scenario #4 - Fuel Oil - 12 RICE, 3X1 Combined Cycle + 1 CT in Simple Cycle:	3,075.97	98.40	0.03

6.4.2.2 NAAQS Results for Modeled Pollutants

Cumulative NAAQS analyses are required for NO₂ 1-hour, NO₂ annual, PM_{2.5} 24-hour, PM_{2.5} annual, and PM₁₀ 24-hour averaging periods based on the results of the significance analysis. As shown in the results tables below, modeled impacts were added to a representative background concentration, and combined impacts are below the NAAQS for each pollutant and averaging period. Thus, the PRS addition does not cause or contribute to a NAAQS exceedance.

Table 6-34. NO₂ 1-hour NAAQS Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration Including Background Concentration (µg/m ³)	NAAQS (µg/m ³)	Below NAAQS?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources + Sheldon Station + Monolith	NO ₂	1-hr	2017-2020, 2022	155.59	188	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	1-hr	2017-2020, 2022	155.62	188	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources + Sheldon Station + Monolith	NO ₂	1-hr	2017-2020, 2022	155.60	188	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	1-hr	2017-2020, 2022	155.64	188	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources + Sheldon Station + Monolith	NO ₂	1-hr	2017-2020, 2022	155.56	188	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	1-hr	2017-2020, 2022	155.56	188	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources + Sheldon Station + Monolith	NO ₂	1-hr	2017-2020, 2022	155.56	188	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	1-hr	2017-2020, 2022	155.57	188	Yes

Table 6-35. NO₂ Annual NAAQS Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	Background Concentration (µg/m ³)	Combined Maximum Impact (µg/m ³)	NAAQS (µg/m ³)	Below NAAQS?
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	Annual	2017	10.96	5.6	16.60	100	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	Annual	2018	10.86	5.6	16.50	100	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	Annual	2019	10.19	5.6	15.83	100	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	Annual	2020	10.84	5.6	16.48	100	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station + Monolith	NO ₂	Annual	2022	11.77	5.6	17.41	100	Yes

Table 6-36. PM_{2.5} 24-hour NAAQS Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	Background Concentration (µg/m ³)	Secondary PM _{2.5} 24-hr Impact (µg/m ³)	Combined Maximum Impact (µg/m ³)	NAAQS (µg/m ³)	Below NAAQS?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources + Sheldon Station	PM _{2.5}	24-hr	2017-2020, 2022	9.78	19.6	0.87	30.25	35	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources + Sheldon Station	PM _{2.5}	24-hr	2017-2020, 2022	9.92	19.6	0.94	30.46	35	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources + Sheldon Station	PM _{2.5}	24-hr	2017-2020, 2022	9.81	19.6	1.03	30.44	35	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources + Sheldon Station	PM _{2.5}	24-hr	2017-2020, 2022	10.00	19.6	1.06	30.66	35	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources + Sheldon Station	PM _{2.5}	24-hr	2017-2020, 2022	9.82	19.6	0.79	30.21	35	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources + Sheldon Station	PM _{2.5}	24-hr	2017-2020, 2022	10.08	19.6	1.02	30.69	35	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources + Sheldon Station	PM _{2.5}	24-hr	2017-2020, 2022	9.85	19.6	0.95	30.39	35	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station	PM _{2.5}	24-hr	2017-2020, 2022	10.15	19.6	1.14	30.89	35	Yes

Table 6-37. PM_{2.5} Annual NAAQS Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	Background Concentration (µg/m ³)	Secondary Annual PM _{2.5} Annual Impact (µg/m ³)	Combined Maximum Impact (µg/m ³)	NAAQS (µg/m ³)	Below NAAQS?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources + Sheldon Station	PM _{2.5}	Annual	2017-2020, 2022	1.41	6.2	0.02	7.63	9	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources + Sheldon Station	PM _{2.5}	Annual	2017-2020, 2022	1.46	6.2	0.03	7.69	9	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources + Sheldon Station	PM _{2.5}	Annual	2017-2020, 2022	1.41	6.2	0.03	7.64	9	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources + Sheldon Station	PM _{2.5}	Annual	2017-2020, 2022	1.47	6.2	0.03	7.70	9	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources + Sheldon Station	PM _{2.5}	Annual	2017-2020, 2022	1.42	6.2	0.02	7.64	9	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources + Sheldon Station	PM _{2.5}	Annual	2017-2020, 2022	1.53	6.2	0.03	7.76	9	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources + Sheldon Station	PM _{2.5}	Annual	2017-2020, 2022	1.43	6.2	0.03	7.65	9	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station	PM _{2.5}	Annual	2017-2020, 2022	1.53	6.2	0.03	7.77	9	Yes

Table 6-38. PM₁₀ 24-hour NAAQS Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	Background Concentration (µg/m ³)	Combined Maximum Impact (µg/m ³)	NAAQS (µg/m ³)	Below NAAQS?
3SCNG	12 RICE, 3 SCCTs, Natural Gas + PRS Sources + Sheldon Station	PM ₁₀	24-hr	2017-2020, 2022	52.45	60	112.45	150	Yes
3SCFO	12 RICE, 3 SCCTs, Fuel Oil + PRS Sources + Sheldon Station	PM ₁₀	24-hr	2017-2020, 2022	52.50	60	112.50	150	Yes
4SCNG	12 RICE, 4 SCCTs, Natural Gas + PRS Sources + Sheldon Station	PM ₁₀	24-hr	2017-2020, 2022	52.46	60	112.46	150	Yes
4SCFO	12 RICE, 4 SCCTs, Fuel Oil + PRS Sources + Sheldon Station	PM ₁₀	24-hr	2017-2020, 2022	52.53	60	112.53	150	Yes
3CCNG	12 RICE, 3X1 CC, Natural Gas + PRS Sources + Sheldon Station	PM ₁₀	24-hr	2017-2020, 2022	52.45	60	112.45	150	Yes
3CCFO	12 RICE, 3X1 CC, Fuel Oil + PRS Sources + Sheldon Station	PM ₁₀	24-hr	2017-2020, 2022	52.51	60	112.51	150	Yes
3CC1SCNG	12 RICE, 3X1 CC, 1 SCCT, Natural Gas + PRS Sources + Sheldon Station	PM ₁₀	24-hr	2017-2020, 2022	52.46	60	112.46	150	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Sheldon Station	PM ₁₀	24-hr	2017-2020, 2022	52.55	60	112.55	150	Yes

6.4.3 PSD Increment Modeling Results

The following tables detail the results of the PSD Increment modeling analysis, which shows that the addition of the PRS sources does not cause an Increment exceedance.

Table 6-39. NO₂ Annual Increment Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	PSD Increment (µg/m ³)	Below Increment?
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Monolith	NO ₂	Annual	2017	8.25	25	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Monolith	NO ₂	Annual	2018	8.18	25	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Monolith	NO ₂	Annual	2019	7.38	25	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Monolith	NO ₂	Annual	2020	7.95	25	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources + Monolith	NO ₂	Annual	2022	8.59	25	Yes

Table 6-40. PM₁₀ 24-hour Increment Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m ³)	PSD Increment (µg/m ³)	Below Increment?
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2017	6.04	30	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2018	6.07	30	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2019	6.77	30	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2020	6.79	30	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM ₁₀	24-hr	2022	6.04	30	Yes

Table 6-41. PM_{2.5} 24-hour Increment Results¹²⁸

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Combined Impact (µg/m ³)	PSD Increment (µg/m ³)	Below Increment?
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2017	7.15	9	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2018	7.35	9	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2019	8.29	9	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2020	7.86	9	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	24-hr	2022	7.50	9	Yes

Table 6-42. PM_{2.5} Annual Increment Results¹²⁹

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Combined Impact (µg/m ³)	PSD Increment (µg/m ³)	Below Increment?
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2017	1.01	4	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2018	1.04	4	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2019	0.95	4	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2020	1.07	4	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM _{2.5}	Annual	2022	1.08	4	Yes

¹²⁸ Combined impact includes both modeled primary impacts and secondary PM_{2.5} impacts calculated using MERPS. Electronically provided spreadsheet provides additional information.

¹²⁹ Ibid.

Table 6-43. PM₁₀ Annual Increment Results

Source Group	Source Group Description	Pollutant	Averaging Period	Modeled Year	Modeled Concentration (µg/m³)	Increment (µg/m³)	Below Increment?
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM10	Annual	2017	0.98	17	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM10	Annual	2018	1.01	17	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM10	Annual	2019	0.91	17	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM10	Annual	2020	1.03	17	Yes
3CC1SCFO	12 RICE, 3X1 CC, 1 SCCT, Fuel Oil + PRS Sources	PM10	Annual	2022	1.05	17	Yes

7. ADDITIONAL IMPACTS ANALYSES

The PSD rules require analyses of the additional impacts from a PSD project to address impacts from growth in the area as well as to address impacts to soils, vegetation and visibility. This section summarizes the additional impacts for the PRS.

7.1 Growth

A growth analysis is intended to assess the amount of new growth that is likely to occur in support of a proposed project and to estimate emissions resulting from associated growth. Associated growth relates to any residential and commercial/industrial growth that may result from the proposed project. Residential growth depends on the number of new employees and the availability of housing in the area, while associated commercial and industrial growth consists of new sources providing services to the new employees and the facility.

The construction of Princeton Road Station is expected to have some impact on employment in the area, but this impact is expected to be minimal. The most significant impact will be during the construction phase. During the construction phase, there will be contract employees at the site, some of whom may temporarily locate to the local area. Following the construction phase, the operation of the PRS is estimated to involve up to 20 employees. These employment opportunities are expected to result in minimal residential and commercial growth in the immediate vicinity of the plant. This minor increase in economic activity will result in secondary air emissions but is not expected to significantly impact air quality.

7.2 Soils and Vegetation

EPA has secondary National Ambient Air Quality Standards for NO₂, SO₂, PM_{2.5}, PM₁₀, and ozone that are designed to protect public welfare by addressing adverse effects on soils, water, crops, vegetation, animals, visibility, and climate. If an area has impacts less than the secondary NAAQS, then EPA considers that the project will not have adverse impacts on items affecting public welfare, including soils and vegetation. Table 7-1 shows a comparison of the predicted modeled impacts of the PRS with respect to the secondary NAAQS. As shown in the table, the predicted modeled impacts are well below the NAAQS, indicating there should be no concerns associated with soil or vegetation impacts associated with this project.

Table 7-1. Summary of Secondary NAAQS Compared to PRS Impacts

Pollutant	Avg Period	Secondary NAAQS (µg/m³)	Cumulative Impact (µg/m³)
NO _x	Annual	100	11.77
SO ₂	Annual	26.2 (10 ppb)	N/A ¹³⁰
PM _{2.5}	24-hr	35	30.89
PM ₁₀	24-hr	150	112.55

¹³⁰ SO₂ Annual impacts from PRS were below significance thresholds. See Section 6.4.1.

Pollutant	Avg Period	Secondary NAAQS ($\mu\text{g}/\text{m}^3$)	Cumulative Impact ($\mu\text{g}/\text{m}^3$)
Ozone	8-hr	70 ppb	64.00 ppb

7.3 Visibility

The focus of the required visibility analysis is to consider whether a new project would impair visibility in the area near the project site due to having a visible plume. NPPD is not expecting to have visible plumes from any of the stacks at PRS for the vast majority of the year. Engines and CTs that burn natural gas and ULSD produce little to no visible plume under normal operating conditions. Natural gas is clean-burning and produces mainly CO_2 and H_2O . The use of ULSD will produce relatively few visibility-impairing particles when compared to other diesel. Occasionally in cold or humid weather, condensation of water vapor may cause a steam-like plume, but this is not related to any air pollutants.

Trinity conducted a review of the visibility impairment in the local area surrounding the new PRS in accordance with the NDEE's response to NPPD's modeling protocol. Since a visible plume would generally be expected to coincide with higher emissions and higher modeled impacts, if the models for the visibility impairing pollutants are in compliance with the air quality standards, this provides reasonable evidence that there will not be visible plumes. On December 27, 2024, NDEE stated their preference that the results from the air dispersion modeling of particulate matter be used to assess any adverse impacts to visibility that could be attributable to PRS. NDEE considers that a project that will not cause or contribute to a violation of an air quality standard for particulate matter will not have an adverse impact on visibility. As shown in Section 6, PRS will not contribute to a violation of any particulate air quality standard.

In short, there will be no adverse impacts in the local area due to plumes from PRS causing visibility impairment.

8. STATE TOXICS BACT

This section presents a review of the Best Available Control Technology (BACT) for HAPs from the PRS. A control technology review is required for any HAP with potential emissions greater than 2.5 tpy. For PRS, these HAPs include acetaldehyde, acrolein, formaldehyde, and manganese. Note, that all of the HAP emissions were estimated using emission factors available from AP-42. For the RICE and combustion turbines, which emit the majority of the HAPs, the AP-42 factors were taken from the following:

1. RICE firing natural gas
 - a. HAP emissions factors are from AP-42 Section 3.2 Table 3.2-2, UNCONTROLLED EMISSION FACTORS FOR 4-STROKE LEAN-BURN ENGINES.
 - b. Note there are no AP-42 factors for any trace HAP metals.
2. RICE firing diesel
 - a. HAP emission factors are from AP-42 Section 3.4 Table 3.4-3, SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES.
 - b. HAP emission factors are from AP-42 Section 3.4 Table 3.4-4, PAH EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES
 - c. Note there are no AP-42 factors for any trace HAP metals.
3. Combustion turbines firing natural gas
 - a. HAP emission factors are from AP-42 Chapter 3 Table 3.1-3, EMISSION FACTORS FOR HAZARDOUS AIR POLLUTANTS FROM NATURAL GAS-FIRED STATIONARY GAS TURBINES
 - b. Note there are no AP-42 factors in this section for any trace HAP metals.
4. Combustion turbines firing diesel
 - a. Organic HAP emission factors are from AP-42 Chapter 3 Table 3.1-4, EMISSION FACTORS FOR HAZARDOUS AIR POLLUTANTS FROM DISTILLATE OIL-FIRED STATIONARY GAS TURBINES
 - b. Metal HAP emission factors are from AP-42 Chapter 3 Table 3.1-5, EMISSION FACTORS FOR METALLIC HAZARDOUS AIR POLLUTANTS FROM DISTILLATE OIL-FIRED STATIONARY GAS TURBINES

Table 8-1 shows the acetaldehyde, acrolein, formaldehyde, and manganese emissions for each of the emissions sources, as these are the HAPs with a PTE greater than 2.5 tpy. The HAP calculations are described in Section 5 of this application, and the detailed calculations are included in Appendix C.

Table 8-1. Summary of HAPs Triggering State BACT

Emission Source	Acetaldehyde (tpy)	Acrolein (tpy)	Formaldehyde (tpy)	Manganese (tpy)
12 RICE	5.96	3.66	13.20	-
4 CTs	0.18	0.03	3.12	30.92
Auxiliary Boiler	-	-	3.21E-02	1.63E-04
RICE Dew Point Heater #1	-	-	1.24E-03	6.27E-06
RICE Dew Point Heater #2	-	-	1.24E-03	6.27E-06
CT Dew Point Heater #1	-	-	1.50E-03	7.60E-06
CT Dew Point Heater #2	-	-	1.50E-03	7.60E-06
CT Dew Point Heater #3	-	-	1.50E-03	7.60E-06

Emission Source	Acetaldehyde (tpy)	Acrolein (tpy)	Formaldehyde (tpy)	Manganese (tpy)
CT Dew Point Heater #4	-	-	1.50E-03	7.60E-06
RICE Emergency Engine #1	5.22E-05	1.63E-05	1.63E-04	-
RICE Emergency Engine #2	5.22E-05	1.63E-05	1.63E-04	-
CT Emergency Engine	1.49E-04	4.65E-05	4.66E-04	-
New Fire Pump	4.23E-04	5.10E-05	6.50E-04	-
Total	6.13	3.69	16.36	30.92

As shown in Table 8-1, most of the potential HAP emissions come from the RICE and CTs. The rest of the sources have insignificant levels of HAP. Both the RICE and CTs will be operated with oxidation catalysts. An oxidation catalyst is the best available control technology for reducing emissions of organic HAPs, such as formaldehyde, acrolein, and acetaldehyde. Since NPPD is already planning to operate the RICE and CTs with oxidation catalysts, no further review of BACT for the organic HAPs is needed.

Table 8-1 shows 30 tpy of potential manganese emissions from the CTs. These emissions are based on an emission factor for distillate oil-fired CTs from AP-42 Chapter 3 Table 3.1-5 (factors for metal HAPs from diesel). The emission factor has a D rating. NPPD does not believe that this emission factor is representative of the manganese that will be emitted by a modern CT burning ULSD. If HAP emissions from the combustion of ULSD were generating this much manganese, then there would be more combustion turbines with baghouses or similar control devices. Simply based on an unverified AP-42 factor, NPPD does not believe that there are additional air pollution control devices that would qualify as BACT for manganese for combustion turbines operating on diesel.