Application for a Minor Modification at a Major Source

Grays Harbor Energy LLC

Grays Harbor Energy Center

401 Keys Road

Elma, WA 98541

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1.0 Introduction

Grays Harbor Energy, LLC owns and operates an electricity generation facility, the Grays Harbor Energy Center (GHEC), located at 401 Keys Road in Elma, Grays Harbor County, Washington. The GHEC facility is an approximately 650 megawatt (MW) facility with two natural gas-fired combustion turbines and one steam-electric turbine with two heat recovery steam generators (HRSG). In addition, the GHEC facility operates one auxiliary boiler, one emergency diesel generator, one cooling tower, and an emergency fire pump engine. Commercial operation began at the facility in April 2008.

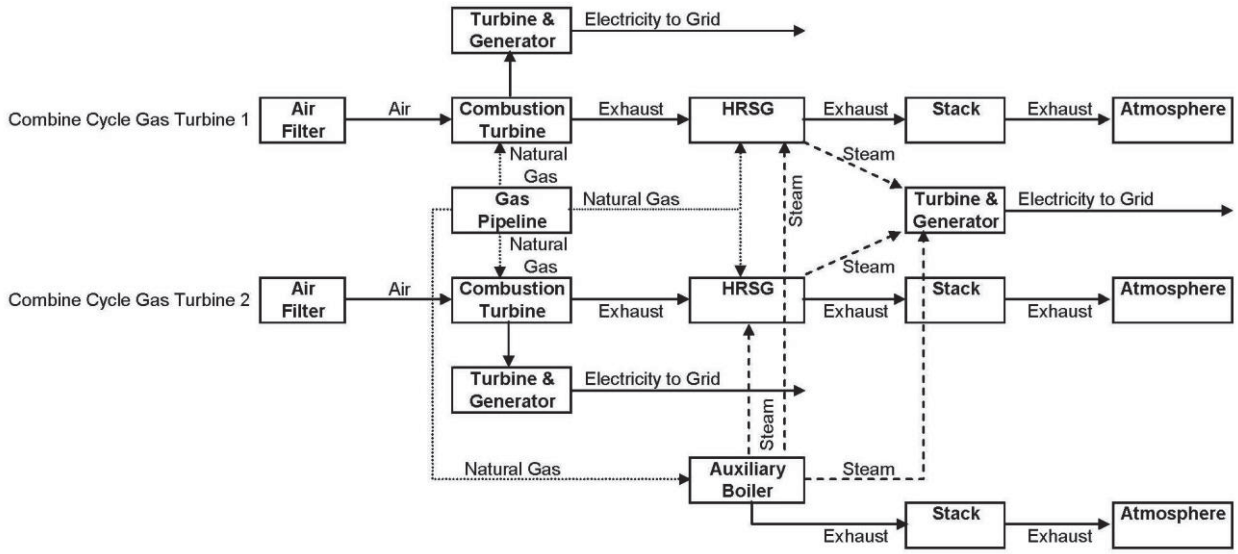
This application is being submitted to gain authorization to install General Electric (GE) combustion turbine (CT) upgrades, which include the Advanced Gas Path (AGP) upgrade. This is an upgrade package for components of the CT that will allow for more efficient combustion of natural gas within the turbines and increased turbine capacity. Since the modification only involves the CT units (CGT01 & CGT02), this application does not include discussion of the other emission units at the site.

2.0 Combustion Turbine Upgrades Project

2.1 Process Description

Each combined-cycle CT consists of a GE Frame 7FA.03 turbine with a nominal rating of 175 MW paired with a HRSG, equipped with a 505 mmBtu/hour duct burner. NO_x emissions from each CT/HRSG are controlled via dry low NOx (DLN) combustors and selective catalytic reduction (SCR). CO emissions are controlled by an oxidation catalyst. All other pollutants are controlled through good combustion practices and the use of pipeline quality natural gas. The configuration of the CT units is outlined in Figure 1.

Figure 1: CT/HRSG Process Flow Diagram



The CTs are permitted to operate 8,760 hours/year and the following emission limits currently apply:

Table 1: GHEC Facility-Wide PTE Summary (tons/year)

PM	PM_{10}	NO_X	CO	SO_2	VOC	H_2SO_4	NH_3
203	203	246.5	146.1	29.2	74.6	19.0	141

Table 2: GHEC CT/HRSG Annual Emission Limits - Including Startup/Shutdown (tons/year)

EU	PM	PM_{10}	NO_X	CO	SO_2	VOC	H_2SO_4	NH_3
CTG01	99.0	99.0	121.7	71.6	14.5	37.5	9.5	70.5
CTG02	99.0	99.0	121.7	71.6	14.5	37.5	9.5	70.5

Table 3: GHEC CT/HRSG Hourly Emission Limits Excluding Startup and Shutdown (pounds/hour)

EU	PM	PM_{10}	NO_X	CO	SO_2	VOC	H_2SO_4	NH_3
CTG01	22.6[1]	22.6[1]	21.7[1]/17.4[2]	10.6[1]	19.8[1]/3.3[3]	6.3[1]	2.17[3]	16.1[2]
CTG02	22.6[1]	22.6[1]	21.7[1]/17.4[2]	10.6[1]	19.8[1]/3.3[3]	6.3[1]	2.17[3]	16.1[2]

Notes:
1. Limits are based on a one-hour averaging period.
2. Limits are based on a 24-hour rolling average.
3. Limits are based on a rolling annual average.

Table 4: GHEC CT/HRSG Emission Concentration Limits Excluding Startup and Shutdown (ppmvd)

EU	NO_X[1]	CO[1]	VOC[1]	NH_3[1]
CTG01	2.5[2]/2.0[3]	2.0[2]	2.8[2]	5.0[3]
CTG02	2.5[2]/2.0[3]	2.0[2]	2.8[2]	5.0[3]

Notes:
1. Limits are corrected to 15% oxygen.
2. Limits are based on a one-hour averaging period.
3. Limits are based on a 24-hour rolling average.

2.2 Combustion Turbine Upgrades Description

The Advanced Gas Path (AGP) package is an upgrade over the standard equipment in the Frame 7FA.03 turbine. According to GE's technical documents, the 7FA Advanced Gas Path (AGP) program utilizes 7FA.04 Hot Gas Path (HGP) technology, incorporating cooling and sealing enhancements and advanced materials to allow efficient operation at increased firing temperatures. Together with the low D/P DLN 2.6 combustor and model-based controls architecture, the AGP uprate delivers improved output and heat rate while maintaining base load emissions levels.

Advanced Hot Gas Path includes a complete set of 7FA.04 design HGP components, to include first, second and third stage nozzles, buckets, and shrouds. A new support ring for the first stage nozzle (S1N) is also included. Technological enhancements included in the AGP upgrade revolve around application of advanced materials used in FB, H-class, and Aviation engines as well as optimization of secondary cooling and sealing flows. Additionally, 3D aerodynamic design methodology has been applied to the first stage nozzle and bucket to further enhance efficiency. Finally, design enhancements have been incorporated to address known FA HGP distress modes.

The Low Pressure Drop (dP/P) Combustor provides increased power output and decreased heat rate by reducing the overall pressure drop across the combustor through the use of newly designed

combustion liners and flow sleeves. By reducing the overall combustion system pressure drop, the advanced liners and flow sleeves effectively improve combustion efficiency.

The new design incorporates axial flow sleeve air injection for improved dynamic pressure recovery and new liner physical features for more uniform and low-loss heat transfer. The newly designed aerodynamic flow sleeve design enhances cooling efficiency across the liner and increases combustor inlet air pressure recovery. Hence, pressure losses through each combustor chamber are reduced.

Following installation of the AGP upgrade, the nominal capacity of each individual CT increases to 181.2 MW, when comparing against the currently permitted capacity of 175 MW to the post-modification GE engineering data in Appendix C at 100% load and 59 degrees F. There is no change in the rated capacity of the duct burner or the steam turbine. Based on GE performance data at 100% load and 59 degrees F, the heat rate will improve (decrease) by approximately 2.3%.

2.3 Permitting Applicability

Because the Combustion Turbine Upgrade package is not a like-kind replacement of the existing equipment and it increases the theoretical capacity of the CTs, it does not qualify as routine maintenance, repair, or replacement; therefore, it is considered a physical change and is subject to New Source Review (NSR). The NSR process is described in Section 3 of this application.

3.0 New Source Review Analysis

According to 40 CFR 52.21(a)(2)(iv)(a), a project is a major modification if it meets both of the following criteria:

- The project results in a significant emissions increase as defined in 52.21(b)(40); and
- A significant net emissions increase occurs as defined in 52.21(b)(3).

Since the modification is taking place on existing emission units (i.e. they have been in operation for two years or more), the actual-to-projected-actual method will be utilized for determining whether the upgrade will result in a significant emissions increase and if a significant net increase in emissions would occur.

3.1 Baseline Actual Emissions

GHEC meets the definition of an electric utility steam generating unit (EUSGU). Baseline Actual Emissions (BAE), as defined in WAC 173-720(4)(a)(vi) and 40 CFR 52.21(b)(48), is the average rate, in tons per year, at which the EUSGU actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 5-year period immediately preceding actual construction of the project. The baseline emissions must include startup and shutdown emissions and downward adjustments for non-compliant emissions. A different 24-month period may be used for each regulated pollutant; however, since the project involves two emission units, both turbines must use the same 24-month period for each pollutant.

Actual monthly emissions data was analyzed from July 2015 through June 2020 in order to determine the appropriate baseline and is summarized below:

Table 5: GHEC CT/HRSG Actual Monthly Emissions

Month	CT1 Emissions (tons)								CT2 Emissions (tons)							
	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Jul-15	1.86	1.86	1.86	4.92	0.23	0.21	0.31	92,175	1.53	1.53	1.53	5.48	0.26	0.21	0.10	90,729
Aug-15	1.74	1.74	1.74	4.52	0.30	0.20	0.29	86,254	1.44	1.44	1.44	5.11	0.32	0.19	0.09	85,495
Sep-15	1.58	1.58	1.58	4.06	0.39	0.19	0.27	78,293	1.31	1.31	1.31	4.60	0.35	0.18	0.08	77,772
Oct-15	1.77	1.77	1.77	4.69	0.40	0.20	0.30	87,594	1.46	1.46	1.46	5.51	0.19	0.20	0.10	86,582
Nov-15	1.61	1.61	1.61	4.28	0.43	0.18	0.26	79,632	1.33	1.33	1.33	5.02	0.33	0.18	0.09	78,897
Dec-15	1.58	1.58	1.58	4.57	0.54	0.18	0.26	78,132	1.30	1.30	1.30	6.78	0.43	0.18	0.09	77,074
Jan-16	1.61	1.61	1.61	4.43	0.53	0.18	0.26	79,616	1.33	1.33	1.33	5.14	0.39	0.18	0.09	79,104
Feb-16	1.05	1.05	1.05	3.56	0.53	0.12	0.18	52,254	0.86	0.86	0.86	3.54	0.41	0.12	0.06	51,200
Mar-16	0.52	0.52	0.52	1.80	0.35	0.11	0.09	25,653	0.47	0.47	0.47	2.23	0.39	0.12	0.03	28,161
Apr-16	0.41	0.41	0.41	1.65	0.39	0.05	0.07	20,267	0.35	0.35	0.35	2.05	0.43	0.05	0.02	20,683
May-16	1.04	1.04	1.04	3.29	0.59	0.11	0.17	51,529	1.06	1.06	1.06	4.64	0.39	0.14	0.07	62,858
Jun-16	0.66	0.66	0.66	3.01	0.73	0.08	0.11	32,926	0.30	0.30	0.30	1.75	0.22	0.04	0.02	17,632
Jul-16	1.49	1.49	1.49	4.06	0.64	0.17	0.25	73,996	1.24	1.24	1.24	4.63	0.40	0.17	0.08	73,727
Aug-16	1.67	1.67	1.67	4.42	0.44	0.19	0.28	82,603	1.38	1.38	1.38	5.10	0.31	0.19	0.09	82,021
Sep-16	1.65	1.65	1.65	4.74	0.40	0.19	0.28	81,936	1.37	1.37	1.37	4.76	0.23	0.19	0.09	81,232
Oct-16	0.72	0.72	0.72	2.11	0.34	0.08	0.12	35,499	0.59	0.59	0.59	2.23	0.24	0.08	0.04	35,369
Nov-16	0.36	0.36	0.36	1.51	0.40	0.04	0.06	17,837	0.22	0.22	0.22	1.28	0.30	0.03	0.01	13,300
Dec-16	0.81	0.81	0.81	2.50	0.44	0.09	0.13	40,123	0.88	0.88	0.88	4.20	0.58	0.12	0.07	52,471
Jan-17	1.53	1.53	1.53	4.63	0.75	0.17	0.25	75,722	1.25	1.25	1.25	5.07	0.52	0.17	0.09	74,222
Feb-17	0.81	0.81	0.81	2.79	0.58	0.09	0.13	40,088	0.64	0.64	0.64	2.78	0.40	0.09	0.05	37,823
Mar-17	0.14	0.14	0.14	1.28	0.40	0.02	0.02	6,837	0.11	0.11	0.11	0.93	0.30	0.01	0.01	6,305
Apr-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
May-17	0.36	0.36	0.36	3.12	0.99	0.04	0.06	17,778	0.27	0.27	0.27	2.97	0.83	0.04	0.02	15,900
Jun-17	0.36	0.36	0.36	2.93	0.93	0.08	0.06	17,769	0.27	0.27	0.27	2.08	0.54	0.07	0.02	16,334
Jul-17	1.61	1.61	1.61	4.49	0.54	0.17	0.27	79,595	1.29	1.29	1.29	4.67	0.27	0.17	0.08	76,540
Aug-17	1.81	1.81	1.81	5.04	0.40	0.20	0.30	89,787	1.48	1.48	1.48	5.32	0.19	0.19	0.10	88,103

Month	CT1 Emissions (tons)								CT2 Emissions (tons)							
	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Sep-17	1.53	1.53	1.53	4.44	0.52	0.17	0.26	76,074	1.28	1.28	1.28	4.56	0.34	0.17	0.08	75,990
Oct-17	1.63	1.63	1.63	5.26	0.72	0.19	0.27	80,869	1.35	1.35	1.35	4.94	0.38	0.19	0.09	80,273
Nov-17	1.03	1.03	1.03	4.22	0.76	0.12	0.17	51,292	0.84	0.84	0.84	3.36	0.38	0.12	0.06	49,921
Dec-17	1.65	1.65	1.65	5.06	0.66	0.19	0.27	81,910	1.38	1.38	1.38	4.93	0.39	0.19	0.11	81,836
Jan-18	0.74	0.74	0.74	4.01	0.89	0.08	0.12	36,685	0.59	0.59	0.59	2.88	0.34	0.08	0.05	35,061
Feb-18	0.69	0.69	0.69	4.21	1.00	0.15	0.11	34,399	0.55	0.55	0.55	2.84	0.47	0.14	0.04	32,620
Mar-18	1.37	1.37	1.37	4.79	0.88	0.15	0.22	67,700	1.11	1.11	1.11	4.46	0.39	0.14	0.08	66,317
Apr-18	0.90	0.90	0.90	4.20	0.88	0.20	0.15	44,828	0.77	0.77	0.77	3.74	0.39	0.20	0.05	45,986
May-18	0.15	0.15	0.15	1.29	0.32	0.02	0.02	7,321	0.12	0.12	0.12	1.00	0.19	0.02	0.01	7,429
Jun-18	0.63	0.63	0.63	3.35	0.71	0.07	0.10	31,268	0.55	0.55	0.55	3.62	0.55	0.07	0.04	32,958
Jul-18	1.73	1.73	1.73	5.31	0.36	0.19	0.29	85,948	1.44	1.44	1.44	5.43	0.19	0.19	0.10	85,510
Aug-18	1.82	1.82	1.82	5.52	0.39	0.59	0.30	90,434	1.50	1.50	1.50	5.52	0.18	0.58	0.10	89,115
Sep-18	1.75	1.75	1.75	5.34	0.38	0.57	0.29	86,606	1.47	1.47	1.47	5.25	0.14	0.58	0.10	87,277
Oct-18	0.61	0.61	0.61	2.12	0.27	0.07	0.10	30,078	0.46	0.46	0.46	2.13	0.17	0.06	0.03	27,234
Nov-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Dec-18	0.44	0.44	0.44	2.19	0.53	0.05	0.07	21,759	0.48	0.48	0.48	3.42	0.52	0.06	0.03	28,726
Jan-19	1.62	1.62	1.62	4.90	0.59	0.19	0.26	80,323	1.38	1.38	1.38	4.85	0.38	0.19	0.10	82,266
Feb-19	0.35	0.35	0.35	1.18	0.20	0.04	0.06	17,343	0.29	0.29	0.29	1.35	0.17	0.04	0.02	17,465
Mar-19	0.97	0.97	0.97	2.90	0.49	0.36	0.16	47,990	0.89	0.89	0.89	4.33	0.56	0.39	0.06	53,164
Apr-19	0.72	0.72	0.72	5.85	0.49	0.08	0.12	35,549	0.62	0.62	0.62	6.72	0.40	0.08	0.04	36,981
May-19	0.43	0.43	0.43	1.39	0.21	0.05	0.07	21,506	0.40	0.40	0.40	1.67	0.12	0.05	0.03	23,717
Jun-19	0.84	0.84	0.84	2.79	0.46	0.28	0.14	41,885	0.68	0.68	0.68	4.26	0.36	0.27	0.04	40,378
Jul-19	1.82	1.82	1.82	4.55	0.38	0.40	0.31	90,269	1.47	1.47	1.47	5.25	0.15	0.38	0.10	87,671
Aug-19	1.88	1.88	1.88	4.92	0.37	0.21	0.31	93,335	1.53	1.53	1.53	5.07	0.12	0.21	0.10	91,088
Sep-19	1.81	1.81	1.81	4.64	0.37	0.20	0.30	89,872	1.49	1.49	1.49	4.47	0.16	0.20	0.10	88,618
Oct-19	4.56	4.56	4.56	4.57	0.61	0.17	0.20	74,498	3.85	3.85	3.85	4.16	0.46	0.15	0.18	67,644
Nov-19	3.32	3.32	3.32	3.40	0.46	0.12	0.15	54,128	3.01	3.01	3.01	2.96	0.30	0.12	0.14	52,825

Month	CT1 Emissions (tons)								CT2 Emissions (tons)							
	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Dec-19	5.69	5.69	5.69	4.71	0.47	0.61	0.25	92,891	5.31	5.31	5.31	4.77	0.23	0.61	0.24	93,166
Jan-20	4.92	4.92	4.92	4.41	0.72	0.19	0.22	80,301	1.49	1.49	1.49	1.53	0.21	0.06	0.07	26,184
Feb-20	3.42	3.42	3.42	3.34	0.66	0.13	0.15	55,879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Mar-20	5.94	5.94	5.94	4.90	0.86	0.63	0.26	97,020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Apr-20	4.59	4.59	4.59	3.83	0.59	0.49	0.20	74,853	2.74	2.74	2.74	3.48	0.33	0.32	0.12	48,100
May-20	0.00	0.00	0.00	0.02	0.05	0.00	0.00	11	0.00	0.00	0.00	0.01	0.04	0.00	0.00	11
Jun-20	0.00	0.00	0.00	0.06	0.06	0.00	0.00	31	0.09	0.09	0.09	0.26	0.08	0.01	0.00	1,644

Table 6: GHEC Rolling 24-Month Annual Averages (CT1/HRSG1 + CT2/HRSG2)

	24-month Annual Avg. Emissions (tons)							
Month	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Jun-17	23.15	23.15	23.15	83.38	10.24	2.96	2.81	1,249,702
Jul-17	22.90	22.90	22.90	82.76	10.40	2.92	2.78	1,236,318
Aug-17	22.96	22.96	22.96	83.12	10.39	2.92	2.79	1,239,388
Sep-17	22.92	22.92	22.92	83.29	10.45	2.91	2.79	1,237,388
Oct-17	22.79	22.79	22.79	83.29	10.70	2.90	2.77	1,230,871
Nov-17	22.26	22.26	22.26	82.43	10.89	2.84	2.71	1,202,213
Dec-17	22.33	22.33	22.33	81.75	10.93	2.85	2.72	1,206,483
Jan-18	21.53	21.53	21.53	80.41	11.09	2.75	2.63	1,162,996
Feb-18	21.19	21.19	21.19	80.39	11.35	2.77	2.59	1,144,778
Mar-18	21.94	21.94	21.94	83.00	11.62	2.80	2.68	1,184,880
Apr-18	22.39	22.39	22.39	85.12	11.84	2.95	2.73	1,209,812
May-18	21.48	21.48	21.48	82.30	11.61	2.85	2.63	1,159,993
Jun-18	21.59	21.59	21.59	83.40	11.76	2.86	2.63	1,166,827
Jul-18	21.81	21.81	21.81	84.43	11.52	2.88	2.66	1,178,695
Aug-18	21.94	21.94	21.94	85.19	11.43	3.27	2.68	1,186,157
Sep-18	22.04	22.04	22.04	85.73	11.37	3.66	2.69	1,191,515
Oct-18	21.92	21.92	21.92	85.69	11.30	3.64	2.67	1,184,737
Nov-18	21.63	21.63	21.63	84.29	10.95	3.61	2.64	1,169,168
Dec-18	21.25	21.25	21.25	83.75	10.97	3.56	2.59	1,148,114
Jan-19	21.36	21.36	21.36	83.77	10.82	3.58	2.60	1,154,436
Feb-19	20.95	20.95	20.95	82.25	10.51	3.53	2.55	1,132,885
Mar-19	21.76	21.76	21.76	84.76	10.69	3.89	2.64	1,176,891
Apr-19	22.43	22.43	22.43	91.05	11.13	3.97	2.72	1,213,156
May-19	22.53	22.53	22.53	89.53	10.39	3.98	2.73	1,218,928
Jun-19	22.97	22.97	22.97	90.55	10.06	4.18	2.78	1,243,008
Jul-19	23.17	23.17	23.17	90.87	9.92	4.40	2.81	1,253,911

Month	24-month Annual Avg. Emissions (tons)							
	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Aug-19	23.23	23.23	23.23	90.69	9.87	4.41	2.82	1,257,177
Sep-19	23.47	23.47	23.47	90.74	9.71	4.44	2.85	1,270,390
Oct-19	26.19	26.19	26.19	90.01	9.69	4.41	2.86	1,260,890
Nov-19	28.42	28.42	28.42	89.40	9.50	4.41	2.89	1,263,760
Dec-19	32.40	32.40	32.40	89.14	9.33	4.83	2.94	1,274,916
Jan-20	34.94	34.94	34.94	88.67	9.18	4.88	3.00	1,292,285
Feb-20	36.03	36.03	36.03	86.81	8.77	4.80	3.00	1,286,715
Mar-20	37.76	37.76	37.76	84.64	8.57	4.97	2.98	1,268,217
Apr-20	40.59	40.59	40.59	84.32	8.39	5.17	3.04	1,284,286
May-20	40.46	40.46	40.46	83.19	8.18	5.15	3.03	1,276,922
Jun-20	39.91	39.91	39.91	79.87	7.62	5.09	2.96	1,245,647

Note: The first 24-month average that falls within the 60-month baseline period is July 2015 through June 2017.

The following 24-month periods represent BAE, with the corresponding emissions summarized in Table 7:

- PM/PM_{10}/$PM_{2.5}$: May 2018 – April 2020
- NO_X: May 2017 – April 2019
- CO: May 2016 – April 2018
- SO_2: May 2018 – April 2020
- VOC: May 2018 – April 2020
- CO_2e: February 2018 – January 2020

Table 7: Baseline Actual Emissions (tons)

PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC	CO_2e
40.59	40.59	40.59	91.05	11.84	5.17	3.04	1,292,285

3.2 Projected Actual Emissions

Projected Actual Emissions (PAE), as defined in 40 CFR 52.21(b)(41), which is adopted by reference in WAC 173-400-720(4)(a)(vi), is the maximum annual rate, in tons per year, at which an existing emissions unit is projected to emit a regulated NSR pollutant in any one of the 5 years (12-month period) following the date the unit resumes regular operation after the project, or in any one of the 10 years following that date, if the project involves increasing the emission unit's design capacity or its potential to emit that regulated NSR pollutant and full utilization of the unit would result in a significant emissions increase or a significant net emissions increase at the major stationary source. Since the Combustion Turbine Upgrade increases the design capacity of the turbines and full utilization would result in either a significant emissions increase or a significant net emissions increase, the 10-year evaluation period is applicable. According to 40 CFR 52.21(b)(41)(ii)(c), PAE calculations shall exclude, in calculating any increase in emissions that results from the particular project, that portion of the unit's emissions following the project that an existing unit could have accommodated during the consecutive 24-month period used to establish the baseline actual emissions that are also unrelated to the particular project, including any increased utilization due to product demand growth.

3.2.1 Future Operations Projections

Grays Harbor Energy LLC, which is the owner of the GHEC facility, has projected post-modification power demand for distribution into the grid from 2022 through 2029 based on the future market conditions, irrespective of any upgrades. The Northwest Power Pool (NWPP) is starting to experience tightening reserve margins due to the projected retirement of more than 4,400 MW of coal-fired and hydroelectric power plants in the near term, along with an expected 0.5% annual growth in peak demand[1]. The table below outlines the projected power plant retirement schedule:

[1] Source: SNL, PA Consulting, NERC

Table 8: NWPP Projected Power Plant Retirements

Plant Name	Summer Capacity (MW)	Type	Approx. Distance to Grays Harbor (mi)	Retirement Year
Centralia 1	670	Coal	30	2020
Centralia 2	670	Coal	30	2025
Colstrip (1-2)	614	Coal	800	2019
Colstrip (3-4)	1480	Coal	800	2027
Boardman	585	Coal	200	2020
North Valmy 1	254	Coal	520	2019
Copco	62	Hydro	350	2021
John C Boyle	98	Hydro	340	2020
Iron Gate	19	Hydro	350	2020

Total Retired Production: 4,452 MW[2]

GHEC is one of the most efficient gas-fired power plants located in the NWPP; therefore, it is expected to operate more hours in the near term due to the retirement of these facilities. Added capacity from the Combustion Turbine Upgrades will effectively displace capacity from other less efficient gas and coal units. In addition, the increase in efficiency resulting from the AGP upgrade is expected to result in GHEC being dispatched slightly more frequently under the upgrade scenario than under the no-upgrade scenario.

Table 9 below summarizes the anticipated power production projections. Projections beyond 2029 are unreliable, but it is anticipated that power demand beyond 2029 will not exceed the worst-case projection as indicated in the period between 2023 and 2029.

[2] Source: SNL, PA Consulting, NERC

Table 9: Projected GHEC Utilization - CT1 and CT2 Combined (including duct burners)

Scenario 1 - Projected Operations Without AGP Upgrade

	Projected Hours			Projected Heat Input (mmBtu/yr)		
Year	Total	Normal	SU/SD	Total	Normal	SU/SD
2022	13,240	12,992	248	28,334,374	28,123,574	210,800
2023	13,621	13,385	236	29,411,870	29,211,270	200,600
2024	13,621	13,385	236	29,411,870	29,211,270	200,600
2025	13,621	13,385	236	29,411,870	29,211,270	200,600
2026	13,621	13,385	236	29,411,870	29,211,270	200,600
2027	13,621	13,385	236	29,411,870	29,211,270	200,600
2028	13,621	13,385	236	29,411,870	29,211,270	200,600
2029	13,621	13,385	236	29,411,870	29,211,270	200,600

Scenario 2 - Projected Operations With AGP Upgrade

	Projected Hours			Projected Heat Input (mmBtu/yr)		
Year	Total	Normal	SU/SD	Total	Normal	SU/SD
2022	13,703	13,439	264	30,530,288	30,305,888	224,400
2023	14,098	13,846	252	31,691,290	31,477,090	214,200
2024	14,098	13,846	252	31,691,290	31,477,090	214,200
2025	14,098	13,846	252	31,691,290	31,477,090	214,200
2026	14,098	13,846	252	31,691,290	31,477,090	214,200
2027	14,098	13,846	252	31,691,290	31,477,090	214,200
2028	14,098	13,846	252	31,691,290	31,477,090	214,200
2029	14,098	13,846	252	31,691,290	31,477,090	214,200

3.2.2 Emission Factors

Emission factors must be used to calculate PAE emissions based on the projections outlined above. According to General Electric (GE), the manufacturer of the turbines and the AGP upgrade package, there will be negligible changes in emission factors during normal unit operations associated with the installation of Combustion Turbine Upgrades. GE also does not expect an increase in startup or shutdown emissions. GHEC has also confirmed with GE that any increased mass emission rates of pollutants that are controlled by either the SCR or oxidation catalyst can be adequately handled by the respective control device and will not result in an emissions increase. Based on this information, GHEC will utilize the same emission factors from historical annual emission reports and CEMS data for calculating PAE. The following factors are used in this analysis:

Table 10: Emission Factors for PAE Analysis

Pollutant	Factor (lb/mmBtu)	Source
$PM/PM_{10}/PM_{2.5}$	0.0042	DAHS calculations, performance testing
NO_X	0.0073 – normal 0.1272 – SU/SD	CEMS data, EDRs
CO	0.0007 – normal 0.0445 – SU/SD	CEMS data
SO_2	0.0005	DAHS calculations, EDRs
VOC	0.0004	DAHS calculations, performance testing
CO_2e	118.98	DAHS calculations, EDRs, 40 CFR 98

3.2.3 Demand Growth Exclusion

As demonstrated in Scenario 1 of Table 9, operations are already projected to increase at GHEC due to the retirement of power generating capability over the next few years. In fact, the total operating hours for the turbines already increased from 9,483 in 2018 to 12,549 in 2019. Because the projected increases in hours do not rely on the installation of AGP, GHEC will analyze the emissions that could have been reasonably accommodated (i.e. demand growth exclusion) during the baseline periods listed in Section 3.1 and subtract that amount from the projected post-modification emissions to calculate PAE, as stated in 40 CFR 52.21(b)(41)(ii)(c).

GHEC will use the monthly total emission rates from Table 6 and calculate a worst-case 2-month average emission rate during each 24-month baseline period. That value will then be multiplied by 12 months to determine the annual emissions that could have been reasonably accommodated.

Table 11: Two-Month Average Emission Rates During the Baseline Period

	Total Emissions (tons)								2-Month Average Emissions (tons/mo)							
	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Month 1	0.27	0.27	0.27	6.09	0.98	0.04	0.03	67,019	--	--	--	--	--	--	--	--
Month 2	1.18	1.18	1.18	5.01	0.95	0.14	0.14	134,017	0.73	0.73	0.73	5.55	0.97	0.09	0.09	100,518
Month 3	3.17	3.17	3.17	9.16	1.04	0.38	0.39	90,814	2.18	2.18	2.18	7.09	1.00	0.26	0.27	112,416
Month 4	3.32	3.32	3.32	10.36	0.75	1.17	0.40	14,750	3.25	3.25	3.25	9.76	0.90	0.78	0.40	52,782
Month 5	3.22	3.22	3.22	9.00	0.63	1.15	0.39	64,226	3.27	3.27	3.27	9.68	0.69	1.16	0.40	39,488
Month 6	1.07	1.07	1.07	10.20	0.58	0.13	0.13	171,458	2.15	2.15	2.15	9.60	0.61	0.64	0.26	117,842
Month 7	0.00	0.00	0.00	7.58	0.70	0.00	0.00	179,549	0.54	0.54	0.54	8.89	0.64	0.07	0.07	175,504
Month 8	0.92	0.92	0.92	9.99	1.02	0.11	0.10	173,883	0.46	0.46	0.46	8.79	0.86	0.06	0.05	176,716
Month 9	3.00	3.00	3.00	6.89	1.27	0.38	0.36	57,312	1.96	1.96	1.96	8.44	1.15	0.25	0.23	115,598
Month 10	0.64	0.64	0.64	7.05	0.98	0.08	0.08	0	1.82	1.82	1.82	6.97	1.13	0.23	0.22	28,656
Month 11	1.86	1.86	1.86	9.25	0.70	0.75	0.22	50,485	1.25	1.25	1.25	8.15	0.84	0.42	0.15	25,243
Month 12	1.34	1.34	1.34	7.94	0.00	0.16	0.16	162,589	1.60	1.60	1.60	8.60	0.35	0.46	0.19	106,537
Month 13	0.83	0.83	0.83	2.29	1.82	0.10	0.10	34,808	1.09	1.09	1.09	5.12	0.91	0.13	0.13	98,699
Month 14	1.52	1.52	1.52	6.97	1.47	0.55	0.18	101,154	1.18	1.18	1.18	4.63	1.65	0.33	0.14	67,981
Month 15	3.29	3.29	3.29	10.74	0.81	0.78	0.41	72,530	2.41	2.41	2.41	8.86	1.14	0.67	0.30	86,842
Month 16	3.41	3.41	3.41	11.04	0.59	0.42	0.41	45,223	3.35	3.35	3.35	10.89	0.70	0.60	0.41	58,877
Month 17	3.30	3.30	3.30	10.59	0.86	0.40	0.40	82,263	3.36	3.36	3.36	10.82	0.73	0.41	0.41	63,743
Month 18	8.41	8.41	8.41	4.25	1.10	0.32	0.38	177,940	5.86	5.86	5.86	7.42	0.98	0.36	0.39	130,102
Month 19	6.33	6.33	6.33	0.00	1.14	0.24	0.29	184,423	7.37	7.37	7.37	2.13	1.12	0.28	0.34	181,182
Month 20	11.00	11.00	11.00	5.61	1.05	1.22	0.49	178,490	8.67	8.67	8.67	2.81	1.10	0.73	0.39	181,457
Month 21	6.41	6.41	6.41	9.75	1.23	0.25	0.29	142,142	8.71	8.71	8.71	7.68	1.14	0.74	0.39	160,316
Month 22	3.42	3.42	3.42	2.53	1.47	0.13	0.15	106,953	4.92	4.92	4.92	6.14	1.35	0.19	0.22	124,548
Month 23	5.94	5.94	5.94	7.23	1.27	0.63	0.26	186,057	4.68	4.68	4.68	4.88	1.37	0.38	0.21	146,505
Month 24	7.33	7.33	7.33	12.57	1.27	0.81	0.32	106,485	6.64	6.64	6.64	9.90	1.27	0.72	0.29	146,271

Table 12: Reasonably Accommodated Emissions

	PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC	CO_2e
Max Rate (Tons/Mo)	8.71	8.71	8.71	10.89	1.65	1.16	0.41	181,457
Annual (Tons/Yr)	104.52	104.52	104.52	130.68	19.80	13.92	4.92	2,177,478

3.2.4 PAE Calculation

Projected emissions using the emission factors from Table 10 and the projected post-modification operating parameters of Scenario 2 in Table 9 are shown below.

Table 13: Projected Emission Calculations (tons/year)

	2022	2023-29
Projected Heat Input (normal)	30,305,888	31,477,090
Projected Heat Input (SU/SD)	224,400	214,200
PM	64.85	67.31
PM10	64.85	67.31
PM2.5	64.85	67.31
NOx	124.47	128.08
CO	16.21	16.41
SO2	7.40	7.69
VOC	5.64	5.85
CO2e	1,816,222	1,885,289

The maximum annual rate for determining future actual emission rates occurs in 2023 and after. Next, the reasonably accommodated emissions are subtracted, and the PAE is calculated.

Table 14: Projected Actual Emissions (tons/year)

	PM	PM10	PM2.5	NOx	CO	SO2	VOC	CO2e
Projected Emissions	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
Reasonable Accommodation	104.52	104.52	104.52	130.68	19.80	13.92	4.92	2,177,478
PAE	-37.21	-37.21	-37.21	-2.60	-3.39	-6.23	0.93	-292,189

For any pollutant where the reasonable accommodation is more than the projected emission rate, the PAE will be set at zero for the NSR analysis.

3.3 NSR Conclusions

The Combustion Turbine Upgrade project would be considered a major modification if both the emissions increase and the net emissions increase for a pollutant exceed the NSR significance threshold. Significant emissions increase is defined in 40 CFR 52.21(b)(40) as an increase in emissions that is significant for that pollutant. The increase is only that which is attributable to the project per 40 CFR 52.21(a)(2)(iv)(a). The emission increase is calculated by subtracting the BAE, as summarized in Table 7, from the PAE, as summarized in Table 14. PAE includes the emissions that could have been reasonably accommodated during the baseline period. Because the reasonably accommodated emissions exceed the projected emissions for every pollutant, other than VOC, based on the operations forecasts in Table 9, the PAE is set at zero for those pollutants.

Net emissions increase (NEI) is defined in 40 CFR 52.21(b)(3) as the amount by which the sum of the increase in emissions from a particular physical change or change in the method of operation at a stationary source as calculated pursuant to paragraph 40 CFR 52.21(a)(2)(iv)(c) exceeds zero. NEI is calculated by adding or subtracting any contemporaneous changes from the emission increase.

Table 15 provides details concerning NSR applicability of the Combustion Turbine Upgrade project based on the above information.

Table 15: Comparison Against New Source Review Thresholds (tons/year)

	PM	PM10	PM2.5	NOx	CO	SO_2	VOC	CO2e
PAE	0	0	0	0	0	0	0.93	0
BAE	40.59	40.59	40.59	91.05	11.84	5.17	3.04	1,292,285
Project Emissions	-40.59	-40.59	-40.59	-91.05	-11.84	-5.17	-2.11	-1,292,285
Threshold	25	15	10	40	100	40	40	75,000

Because there is no netting of contemporaneous changes involved in this project, the emissions change due to the project and the NEI are the same. Because the emission change is negative for all pollutants, the installation of AGP will qualify as a minor modification.

4.0 Regulatory Applicability

The following regulations may potentially be applicable to this modification.

4.1 WAC 173-400-720 & 40 CFR 52.21 – Prevention of Significant Deterioration

Although the project itself is a minor modification and not subject to PSD review, there are still some source obligations in §52.21(r)(6) that may possibly be applicable. Except as otherwise provided in paragraph (r)(6)(vi)*(b)*, the provisions of paragraph (r)(6) apply with respect to any regulated NSR pollutant emitted from projects at existing emissions units at a major stationary source (other than projects at a source with a PAL) in circumstances where there is a reasonable possibility, within the meaning of paragraph (r)(6)(vi) of this section, that a project that is not a part of a major modification may result in a significant emissions increase of such pollutant, and the owner or operator elects to use the method specified in paragraphs (b)(41)(ii)*(a)* through *(c)* of §52.21 for calculating projected actual emissions.

According to WAC 173-400-720(4)(b)(iii)(D)(vi) and 40 CFR 52.21(r)(6)(vi), "reasonable possibility" occurs when the owner or operator calculates the project to result in either a projected actual emissions increase of at least 50 percent of the amount that is a "significant emissions increase," as defined under paragraph (b)(40) of §52.21 (without reference to the amount that is a significant net emissions increase), for the regulated NSR pollutant; or a projected actual emissions increase that, added to the amount of emissions excluded under paragraph (b)(41)(ii)*(c)* of §52.21, sums to at least 50 percent of the amount that is a "significant emissions increase," as defined under paragraph (b)(40) of this §52.21 (without reference to the amount that is a significant net emissions increase), for the regulated NSR pollutant. For a project for which a reasonable possibility occurs only within the meaning of paragraph (r)(6)(vi)*(b)* of this section, and not also within the meaning of paragraph (r)(6)(vi)*(a)* of this section, the provisions of (r)(6)(ii) through (v) do not apply to the project.

In Table 15 of this application, it was determined that the emissions change (PAE – BAE) attributable to the project for all pollutants was negative; therefore, it does not trigger the applicability under (r)(6)(vi)*(a)*.

Table 16 shows the increase in actual emissions, without considering the reasonably accommodated emissions excluded from the PAE, for comparison against the provisions of (r)(6)(vi)*(b)*.

Table 16: Reasonable Possibility Calculations (tons/year) - 40 CFR 52.21(r)(6)(vi)(b)

	PM	**PM_{10}**	**$PM_{2.5}$**	**NOx**	**CO**	**SO_2**	**VOC**	**CO_2e**
Projected Emissions	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
BAE	40.59	40.59	40.59	91.05	11.84	5.17	3.04	1,292,285
Emissions Change	26.72	26.72	26.72	37.03	4.57	2.52	2.81	593,004
Threshold	25	15	10	40	100	40	40	75,000

The increases in PM, PM_{10}, $PM_{2.5}$, NO_x and CO_2e exceed 50% of the significance threshold; therefore, it meets the applicability provisions of §52.21(r)(6)(vi)*(b)*. Because reasonable possibility exists under the provisions of only (r)(6)(vi)*(b)* and not (r)(6)(vi)*(a)*, the source obligation requirements will not apply to this project.

4.2 40 CFR 60 Subpart KKKK – NSPS for Stationary Combustion Turbines

Subpart KKKK is applicable to any stationary combustion turbine that has commenced construction, modification, or reconstruction after February 18, 2005 and has a heat input at peak load of 10 mmBtu/hour or more. The following definitions in 40 CFR 60 Subpart A were also reviewed in relation to this analysis:

- Modification (§60.14): any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies shall be considered a modification within the meaning of section 111 of the Act.
- Reconstruction (§60.15): the replacement of components of an existing facility to such an extent that: (1) The fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, and (2) It is technologically and economically feasible to meet the applicable standards set forth in this part.

Reconstruction is not applicable because the cost of the Combustion Turbine Upgrade is below 50% of the fixed capital cost to construct a new turbine.

In order to determine whether the AGP upgrade meets the definition of a modification, the performance data from GE needs to be analyzed and the effects on NO_x and SO_2 emissions need to be demonstrated. The exhaust data from GE is summarized in Table 17, both pre- and post-modification, for various load profiles at 59 °F.

Table 17: GE Turbine Performance Data

	Pre-Modification			**Post-Modification**		
Load %	**50%**	**80%**	**100%**	**50%**	**80%**	**100%**
Heat Cons. (HHV) mmBtu/hr	1,089	1,463	1,735	1,152	1,525	1,823
NOx (lb/hr)	35.6	47.9	56.8	37.7	49.9	59.7
SO_2 (lb/hr)	0.6	0.8	0.9	0.6	0.8	0.9

Table 18: Post-Modification Performance Data Changes

	Post-Modification Changes		
Load %	**50%**	**80%**	**100%**
Heat Cons. (HHV) mmBtu/hr	63	62	87
NOx (lb/hr)	2.1	2.0	2.9
SO_2 (lb/hr)	0.0	0.0	0.0

Based on this performance data, GE has shown that the NO_x concentration at the inlet of the SCR will increase slightly. Ammonia flow can be adjusted to compensate for any fluctuation in NO_x mass emissions, thereby allowing NO_x emission rates at the stack to remain the same. Therefore, there will be no increase in NO_x emissions as a result of this upgrade.

Based on the calculations in Table 18, there is no increase in SO_2 emissions from the installation of AGP. Therefore, this project is not considered a modification under the NSPS definition. Because the project is neither a modification nor reconstruction, Subpart KKKK will not apply.

4.3 40 CFR 63 Subpart YYYY – NESHAP for Stationary Combustion Turbines

Subpart YYYY is applicable to any source of air pollutants that has the potential to emit 10 tons/year of any single hazardous air pollutant (HAP) or 25 tons/year of any combination of HAPs. The heat input used to determine HAP emissions has increased from the currently permitted rate of 1,671 mmBtu/hr to 1,823 mmBtu/hr, which is based on GE engineering data at 59 degrees F and 100% load. The new HAP PTE totals are shown below:

Table 19: HAP PTE Changes

			Single CT				Total CT	
	CT EF	DB EF	Current PTE		Post-Mod PTE		Current	Post-Mod
Pollutant	(lb/mmBtu)	(lb/mmscf)	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
1,3-Butadiene	0.00000043		0.001	0.003	0.001	0.003	0.01	0.01
Acetaldehyde	0.00004		0.07	0.29	0.07	0.32	0.59	0.64
Acrolein	0.0000064		0.01	0.05	0.01	0.05	0.09	0.10
Arsenic		0.0002	0.0001	0.0004	0.0001	0.0004	0.00	0.00
Benzene	0.000012	0.0021	0.02	0.09	0.02	0.10	0.18	0.20
Beryllium		0.000012	0.00001	0.00003	0.00001	0.00003	0.00	0.00
Cadmium		0.0011	0.0005	0.0024	0.001	0.002	0.00	0.00
Chromium		0.0007	0.0003	0.0015	0.0003	0.0015	0.00	0.00
Cobalt		0.000084	0.00004	0.00018	0.00004	0.00018	0.00	0.00
Ethylbenzene	0.000032		0.05	0.23	0.06	0.26	0.47	0.51
Formaldehyde	0.0001065	0.01125	0.18	0.80	0.20	0.87	1.61	1.75
Hexane		1.8	0.89	3.90	0.89	3.90	7.81	7.81
Manganese		0.00038	0.0002	0.0008	0.0002	0.0008	0.00	0.00
Mercury		0.00026	0.0001	0.0006	0.0001	0.0006	0.00	0.00
Naphthalene	0.0000013	0.00061	0.002	0.01	0.003	0.01	0.02	0.02
Nickel		0.0021	0.001	0.005	0.001	0.005	0.01	0.01
PAH	0.0000022	0.0000096	0.004	0.02	0.004	0.02	0.03	0.04
POM		0.0000882	0.00004	0.00019	0.00004	0.00019	0.00	0.00
Propylene Oxide	0.000029		0.05	0.21	0.05	0.23	0.42	0.46
Selenium		0.000024	0.00001	0.00005	0.00001	0.00005	0.00	0.00
Toluene	0.00013	0.0034	0.22	0.96	0.24	1.05	1.92	2.09
Xylenes	0.000064		0.11	0.47	0.12	0.51	0.94	1.02
TOTALS:			1.61	7.05	1.67	7.34	14.11	14.67

Total HAP emissions from the facility after the Combustion Turbine Upgrade will still be less than 25 tons/year, and emissions of each individual HAP will remain below 10 tons/year. GHEC will remain an area source of HAPs and this regulation will not apply.

4.4 40 CFR 60 Subpart TTTT – NSPS for Greenhouse Gas Emissions for Electric Generating Units

According to 40 CFR 60.5509(a), any stationary combustion turbine that commenced modification after June 18, 2014 must comply with the standards in Subpart TTTT unless it meets one of the conditions in 60.5509(b), which would then exclude the turbine from this regulation. 60.5509(b)(7) states that an electric generating unit that is a steam generating unit that undergoes a modification resulting in an hourly increase in CO_2 emissions (lb/hr) of 10% or less (rounded to 2 significant figures) will not be subject to this regulation.

CO_2 mass emission rates are calculated by the DAHS according to Equation G-4 of 40 CFR 75 Appendix G. The emission rate of CO_2 on an hourly basis is tied directly to the change in heat input; therefore, any increase in heat input can be correlated to an increase in emissions. The heat input of the turbine after the installation of AGP will increase from the permitted rate of 1,671 mmBtu/hr (HHV) to 1,823 mmBtu/hr (HHV, 59 degrees F and 100% load), which is a difference of 9.1%. Because of the direct relationship of CO_2 emissions to heat input, the mass emission rate

will also increase by 9.1%. This is less than the 10% regulatory threshold; therefore, the provisions of Subpart TTTT will not apply.

4.5 WAC 173-460 – Controls for New Sources of Toxic Air Pollutants

WAC 173-460 requires all modified sources of toxic air pollutants (TAPs) to undergo new source review and submit a notice of construction when it is determined to be applicable. Also, modified sources must implement toxics BACT (tBACT) for all pollutant increases that exceed the de minimis threshold.

The TAPs increase was determined by subtracting the current PTE from the new PTE. The current PTE is based on the information that was submitted in the Air Operating Permit Application dated April 2009. The combustion turbine has a permitted heat input of 1,671 mmBtu/hr and the duct burner has a rated heat input of 505 mmBtu/hr. The GCV of natural gas was assumed to be 1,020 Btu/scf. The following table shows the baseline potential hourly emission rates of the turbines prior to modification.

Table 20: Toxic Air Pollutants - Baseline Emissions

Pollutant	CAS	Emission Factor (lb/mmBtu)		Single Turbine Emission Rate (lb/hr)		
		Turbine	Duct Burner	Turbine	Duct Burner	Total
Acetaldehyde	75-07-0	4.00E-05		6.68E-02	0.00E+00	6.68E-02
Acrolein	107-02-8	6.40E-06		1.07E-02	0.00E+00	1.07E-02
Ammonia	7664-41-7					16.1
Arsenic & Compounds NOS	7440-38-2		1.96E-07	0.00E+00	9.90E-05	9.90E-05
Benz(a)anthracene	56-55-3		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Benzene	71-43-2	1.20E-05	2.06E-06	2.01E-02	1.04E-03	2.11E-02
Benzo(a)pyrene	50-32-8		1.18E-09	0.00E+00	5.94E-07	5.94E-07
Benzo(b)fluoranthene	205-99-2		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Benzo(k)fluoranthene	207-08-9		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Beryllium & Compounds NOS	N/A		1.18E-08	0.00E+00	5.94E-06	5.94E-06
1,3-Butadiene	106-99-0	4.30E-07		7.19E-04	0.00E+00	7.19E-04
Cadmium & Compounds NOS	7440-43-9		1.08E-06	0.00E+00	5.45E-04	5.45E-04
Chromium(VI) & Compounds NOS	7440-43-9		1.37E-06	0.00E+00	6.93E-04	6.93E-04
Chrysene	218-01-9		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Cobalt & Compounds NOS	7440-48-4		8.24E-08	0.00E+00	4.16E-05	4.16E-05
Copper & Compounds NOS	7440-50-8		8.33E-07	0.00E+00	4.21E-04	4.21E-04
Dibenzo(a,h)anthracene	53-70-3		1.18E-09	0.00E+00	5.94E-07	5.94E-07
7,12-Dimethylbenz(a)anthracene	57-97-6		1.57E-08	0.00E+00	7.92E-06	7.92E-06
Ethylbenzene	100-41-4	3.20E-05		5.35E-02	0.00E+00	5.35E-02
Formaldehyde	50-00-0	1.07E-04	1.10E-05	1.78E-01	5.57E-03	1.84E-01
Hexane	110-54-3		1.76E-03	0.00E+00	8.91E-01	8.91E-01
Indeno(1,2,3-cd)pyrene	193-39-5		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Lead & Compounds NOS	N/A		4.90E-07	0.00E+00	2.48E-04	2.48E-04
Manganese & Compounds NOS	7439-96-5		3.73E-07	0.00E+00	1.88E-04	1.88E-04
Mercury	7439-97-6		2.55E-07	0.00E+00	1.29E-04	1.29E-04
3-Methylcholanthrene	56-49-5		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Naphthalene	91-20-3	1.30E-06	5.98E-07	2.17E-03	3.02E-04	2.47E-03
Nickel & Compounds NOS	7440-02-0		2.06E-06	0.00E+00	1.04E-03	1.04E-03
Propylene Oxide	75-56-9	2.90E-05		4.85E-02	0.00E+00	4.85E-02
Selenium & Compounds NOS	7782-49-2		2.35E-08	0.00E+00	1.19E-05	1.19E-05
Toluene	108-88-3	1.30E-04	3.33E-06	2.17E-01	1.68E-03	2.19E-01
Vanadium	7440-62-2		2.25E-06	0.00E+00	1.14E-03	1.14E-03
Xylenes	1330-20-7	6.40E-05		1.07E-01	0.00E+00	1.07E-01

The emission rates, except for ammonia, were calculated using the following formulas:

CT Emission Rates

$$\frac{1{,}671\ mmBtu}{hr} \times \frac{EF\ lb}{mmBtu} = TAP_{CT}\,\frac{lb}{hr}$$

Duct Burner Emission Rates

$$\frac{505\ mmBtu}{hr} \times \frac{EF\ lb}{mmscf} \div \frac{1{,}020\ mmBtu}{mmscf} = TAP_{DB}\,\frac{lb}{hr}$$

Total TAP Emissions

$$TAP_{CT} + TAP_{DB} = TAP_{TOT}\,\frac{lb}{hr}$$

Ammonia emission rates are based on the manufacturer's data provided in the April 2009 Operating Permit application.

The new TAP PTE is based on the post-modification emissions data, provided by GE, for 100% load and 59 °F for the turbines and the existing duct burner information. The turbine will have a new rated heat input of 1,823 mmBtu/hr and the duct burner will remain unchanged at 505 mmBtu/hr.

Table 21: Toxic Air Pollutants - Post-Modification Emissions

Pollutant	CAS	Emission Factor (lb/mmBtu)		Single Turbine Emission Rate (lb/hr)		
		Turbine	Duct Burner	Turbine	Duct Burner	Total
Acetaldehyde	75-07-0	4.00E-05		7.29E-02	0.00E+00	7.29E-02
Acrolein	107-02-8	6.40E-06		1.17E-02	0.00E+00	1.17E-02
Ammonia	7664-41-7					16.1
Arsenic & Compounds NOS	7440-38-2		1.96E-07	0.00E+00	9.90E-05	9.90E-05
Benz(a)anthracene	56-55-3		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Benzene	71-43-2	1.20E-05	2.06E-06	2.19E-02	1.04E-03	2.29E-02
Benzo(a)pyrene	50-32-8		1.18E-09	0.00E+00	5.94E-07	5.94E-07
Benzo(b)fluoranthene	205-99-2		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Benzo(k)fluoranthene	207-08-9		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Beryllium & Compounds NOS	N/A		1.18E-08	0.00E+00	5.94E-06	5.94E-06
1,3-Butadiene	106-99-0	4.30E-07		7.84E-04	0.00E+00	7.84E-04
Cadmium & Compounds NOS	7440-43-9		1.08E-06	0.00E+00	5.45E-04	5.45E-04
Chromium(VI) & Compounds NOS	7440-43-9		1.37E-06	0.00E+00	6.93E-04	6.93E-04
Chrysene	218-01-9		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Cobalt & Compounds NOS	7440-48-4		8.24E-08	0.00E+00	4.16E-05	4.16E-05
Copper & Compounds NOS	7440-50-8		8.33E-07	0.00E+00	4.21E-04	4.21E-04
Dibenzo(a,h)anthracene	53-70-3		1.18E-09	0.00E+00	5.94E-07	5.94E-07
7,12-Dimethylbenz(a)anthracene	57-97-6		1.57E-08	0.00E+00	7.92E-06	7.92E-06
Ethylbenzene	100-41-4	3.20E-05		5.83E-02	0.00E+00	5.83E-02
Formaldehyde	50-00-0	1.07E-04	1.10E-05	1.94E-01	5.57E-03	2.00E-01
Hexane	110-54-3		1.76E-03	0.00E+00	8.91E-01	8.91E-01
Indeno(1,2,3-cd)pyrene	193-39-5		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Lead & Compounds NOS	N/A		4.90E-07	0.00E+00	2.48E-04	2.48E-04
Manganese & Compounds NOS	7439-96-5		3.73E-07	0.00E+00	1.88E-04	1.88E-04
Mercury	7439-97-6		2.55E-07	0.00E+00	1.29E-04	1.29E-04
3-Methylcholanthrene	56-49-5		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Naphthalene	91-20-3	1.30E-06	5.98E-07	2.37E-03	3.02E-04	2.67E-03
Nickel & Compounds NOS	7440-02-0		2.06E-06	0.00E+00	1.04E-03	1.04E-03
Propylene Oxide	75-56-9	2.90E-05		5.29E-02	0.00E+00	5.29E-02
Selenium & Compounds NOS	7782-49-2		2.35E-08	0.00E+00	1.19E-05	1.19E-05
Toluene	108-88-3	1.30E-04	3.33E-06	2.37E-01	1.68E-03	2.39E-01
Vanadium	7440-62-2		2.25E-06	0.00E+00	1.14E-03	1.14E-03
Xylenes	1330-20-7	6.40E-05		1.17E-01	0.00E+00	1.17E-01

Emissions, except for ammonia, are calculated as follows:

CT Emission Rates

$$\frac{1{,}823\ mmBtu}{hr} \times \frac{EF\ lb}{mmBtu} = TAP_{CT}\,\frac{lb}{hr}$$

Duct Burner Emission Rates

$$\frac{505\ mmBtu}{hr} \times \frac{EF\ lb}{mmscf} \div \frac{1{,}020\ mmBtu}{mmscf} = TAP_{DB}\,\frac{lb}{hr}$$

Total TAP Emissions

$$TAP_{CT} + TAP_{DB} = TAP_{TOT}\,\frac{lb}{hr}$$

According to the SCR manufacturer, the original manufacturer's guarantee of 16.1 lb/hr of ammonia slip will still be valid after the installation of AGP; therefore, it remains unchanged for this analysis.

4.5.1 De Minimis Emission Changes

The first step in determining the applicability of new source review is to compare the change in total TAP emissions for both combustion turbines, including duct burner emissions, to exempt pollutants from a more detailed review. Any pollutant increases that fall below the de minimis levels, per WAC 173-460-040(1), do not have to undergo new source review. The increase was determined by subtracting the baseline PTE from the modified PTE and multiplying by two in order to account for both turbines. The increase was then adjusted for the proper averaging period. For a 24-hour standard, the hourly increase was multiplied by 24. For an annual standard, the hourly increase was multiplied by 8,760.

Table 22: Toxic Air Pollutants - De Minimis Analysis

Pollutant	CAS	De minimis Standard		Emission Increase (CT1 + CT2)		Exempt From 173-460 Analysis?
		Threshold	Unit	lb/hr	lb/standard unit	
Acetaldehyde	75-07-0	3.00E+00	lb/year	1.22E-02	1.07E+02	NO
Acrolein	107-02-8	1.30E-03	lb/24-hr	1.95E-03	4.67E-02	NO
Ammonia	7664-41-7	1.90E+00	lb/24-hr	0.00E+00	0.00E+00	YES
Arsenic & Compounds NOS	7440-38-2	2.50E-03	lb/year	0.00E+00	0.00E+00	YES
Benz(a)anthracene	56-55-3	4.50E-02	lb/year	0.00E+00	0.00E+00	YES
Benzene	71-43-2	1.00E+00	lb/year	3.65E-03	3.20E+01	NO
Benzo(a)pyrene	50-32-8	8.20E-03	lb/year	0.00E+00	0.00E+00	YES
Benzo(b)fluoranthene	205-99-2	4.50E-02	lb/year	0.00E+00	0.00E+00	YES
Benzo(k)fluoranthene	207-08-9	4.50E-02	lb/year	0.00E+00	0.00E+00	YES
Beryllium & Compounds NOS	N/A	3.40E-03	lb/year	0.00E+00	0.00E+00	YES
1,3-Butadiene	106-99-0	2.70E-01	lb/year	1.31E-04	1.15E+00	NO
Cadmium & Compounds NOS	7440-43-9	1.90E-03	lb/year	0.00E+00	0.00E+00	YES
Chromium(VI) & Compounds NOS	7440-43-9	3.30E-05	lb/year	0.00E+00	0.00E+00	YES
Chrysene	218-01-9	4.50E-01	lb/year	0.00E+00	0.00E+00	YES
Cobalt & Compounds NOS	7440-48-4	3.70E-04	lb/24-hr	0.00E+00	0.00E+00	YES
Copper & Compounds NOS	7440-50-8	9.30E-03	lb/1-hr	0.00E+00	0.00E+00	YES
Dibenzo(a,h)anthracene	53-70-3	4.10E-03	lb/year	0.00E+00	0.00E+00	YES
7,12-Dimethylbenz(a)anthracene	57-97-6	6.90E-05	lb/year	0.00E+00	0.00E+00	YES
Ethylbenzene	100-41-4	3.20E+00	lb/year	9.73E-03	8.52E+01	NO
Formaldehyde	50-00-0	1.40E+00	lb/year	3.24E-02	2.84E+02	NO
Hexane	110-54-3	2.60E+00	lb/24-hr	0.00E+00	0.00E+00	YES
Indeno(1,2,3-cd)pyrene	193-39-5	4.50E-02	lb/year	0.00E+00	0.00E+00	YES
Lead & Compounds NOS	N/A	1.00E+01	lb/year	0.00E+00	0.00E+00	YES
Manganese & Compounds NOS	7439-96-5	1.10E-03	lb/24-hr	0.00E+00	0.00E+00	YES
Mercury	7439-97-6	1.10E-04	lb/24-hr	0.00E+00	0.00E+00	YES
3-Methylcholanthrene	56-49-5	7.80E-04	lb/year	0.00E+00	0.00E+00	YES
Naphthalene	91-20-3	2.40E-01	lb/year	3.95E-04	3.46E+00	NO
Nickel & Compounds NOS	7440-02-0	3.10E-02	lb/year	0.00E+00	0.00E+00	YES
Propylene Oxide	75-56-9	2.20E+00	lb/year	8.82E-03	7.72E+01	NO
Selenium & Compounds NOS	7782-49-2	7.40E-02	lb/24-hr	0.00E+00	0.00E+00	YES
Toluene	108-88-3	1.90E+01	lb/24-hr	3.95E-02	9.00E-01	YES
Vanadium	7440-62-2	3.70E-04	lb/24-hr	0.00E+00	0.00E+00	YES
Xylenes	1330-20-7	8.20E-01	lb/24-hr	1.95E-02	4.67E-01	YES

For the TAPs not excluded in the de minimis analysis, the emissions increase is subject to tBACT, and the emissions after the application of tBACT must be demonstrated to be less than either the small quantity emission rate (SQER) or the ambient source impact level (ASIL) listed in WAC 173-460-150 to avoid a more detailed analysis.

4.5.2 Toxics BACT

On August 31, 2005, an updated best available control technology (BACT) analysis was submitted to EFSEC as a condition of the extension of the PSD permit to accommodate the construction schedule. The analysis included a review of tBACT for the turbines and determined that the exclusive use of natural gas as a fuel was sufficient for tBACT. The selective catalytic reduction (SCR) and oxidation catalyst systems that are installed to control other pollutants were observed to have the additional effect of reducing certain TAP emissions.

Grays Harbor conducted an updated review to determine if there were any additional technologies that should be considered at this time. A BACT decision for a combined cycle gas turbine in the Sacramento Metropolitan AQMD, dated October 30, 2018, was reviewed because it encompasses a review of several different control technology clearinghouses and includes a discussion on tBACT. A copy of this BACT decision is included in Appendix E. The clearinghouses reviewed were: USEPA, CARB, South Coast AQMD, Sacramento Metropolitan AQMD, San Diego County APCD, Bay Area AQMD, San Joaquin Valley APCD, and CAPCOA. None of these had a specific tBACT determination identified. It was ultimately determined that the majority of risks from TAPs came from VOCs; therefore, the VOC BACT would suffice as tBACT.

BACT for VOC emissions at the GHEC is the use of good combustion practices and the use of dry low-NOx (DLN) burners. The AGP upgrade will allow for more efficient combustion of natural gas and the turbines' oxidation catalysts will continue to maintain emissions within currently permitted levels. Based on this information, Grays Harbor will continue to use good combustion practices, DLN burners, and the exclusive use of natural gas as a fuel to comply with tBACT requirements.

4.5.3 Tier 1 Screening Analysis

For all TAP increases above de minimis levels, a Tier 1 screening analysis must occur. In order for a construction permit to be issued for a project, the increase in emissions after the application of tBACT must either be less than the SQER or the ASIL for each TAP. The first step in the Tier 1 analysis is to determine whether any of the increases are less than the SQER. The emission increases calculated for Table 22 above compare to the SQER as follows:

Table 23: Toxic Air Pollutants - SQER Analysis

Pollutant	CAS	SQER Standard		Emission Increase (CT1 + CT2)		Increase < SQER?
		Threshold	Unit	lb/hr	lb/threshold unit	
Acetaldehyde	75-07-0	6.00E+01	lb/year	1.22E-02	1.07E+02	NO
Acrolein	107-02-8	2.60E-02	lb/24-hr	1.95E-03	4.67E-02	NO
Benzene	71-43-2	2.10E+01	lb/year	3.65E-03	3.20E+01	NO
1,3-Butadiene	106-99-0	5.40E+00	lb/year	1.31E-04	1.15E+00	YES
Ethylbenzene	100-41-4	6.50E+01	lb/year	9.73E-03	8.52E+01	NO
Formaldehyde	50-00-0	2.70E+01	lb/year	3.24E-02	2.84E+02	NO
Naphthalene	91-20-3	4.80E+00	lb/year	3.95E-04	3.46E+00	YES
Propylene Oxide	75-56-9	4.40E+01	lb/year	8.82E-03	7.72E+01	NO

Only two TAPs were screened out using the SQER analysis. This means a dispersion model must be used to compare increases for the remaining TAPs against the ASIL to determine compliance. Grays Harbor has chosen to use the AERSCREEN model as a conservative estimate. The following methodology was used for the screening procedure:

1. Since both stacks are identical, it was conservatively estimated that the total emissions increase for both turbines would be emitted from the stack closest to the fenceline.
2. The following point source parameters were used to model offsite concentrations
    a. The model was run using an emission rate of 1.0 lb/hr and the resulting concentration was adjusted for each pollutant using the following ratio:

$$\frac{modeled\ conc\ (\mu g/m^3)}{1.0\ lb/hr} = \frac{pollutant\ conc\ (\mu g/m^3)}{emission\ increase\ lb/hr}$$

   b. Stack height – 180 ft
   c. Stack diameter – 216 in
   d. Exhaust flowrate – 1,006,855 acfm
   e. Exhaust temperature – 200 °F
   f. Rural dispersion coefficient
3. No building downwash parameters were selected.
   a. The stack is not adjacent to a solid building.
4. The following terrain parameters were used:
   a. Base elevation of the source – 0 ft
   b. No terrain elevations
   c. Flagpole receptor of 1.5 m to simulate average human height.
5. No fumigation parameters were selected.
6. The following MAKEMET meteorology parameters were selected:
   a. Temperature range – 32 to 78 °F
      i. Minimum value based on minimum month of daily averages for Olympia, WA. Data source is the NCDC Comparative Climactic Data.
      ii. Maximum value based on maximum month of daily averages for Olympia, WA. Data source is the NCDC Comparative Climactic Data.
   b. Minimum wind speed – 2.2 m/s
      i. Minimum month of daily averages for Olympia, WA. Data source is the NCDC Comparative Climactic Data.
   c. Anemometer height – 10.0 m (default)
   d. Surface characteristics from AERMET seasonal tables
      i. Dominant surface profile – coniferous forest
      ii. Dominant climate – wet conditions
      iii. No adjustment to surface friction velocity
7. The distance from the stack to the fenceline is 200 m.

The resulting maximum modeled offsite concentrations of an emission rate of 1.0 lb/hr are 0.1854 µg/m^3 (1-hour), 0.1112 µg/m^3 (24-hour), and 0.0185 µg/m^3 (annual). The AERSCREEN modeling results are provided in Appendix D.

For the TAP with a 24-hour ASIL standard, offsite concentration is calculated as follows:

$$\frac{0.1112\ (\mu g/m^3)\ \times emission\ increase\ lb/hr}{1.0\ lb/hr} = pollutant\ conc\ (\mu g/m^3)$$

For the TAPs with an annual ASIL standard, offsite concentration is calculated as follows:

$$\frac{0.0185\ (\mu g/m^3)\ \times emission\ increase\ lb/hr}{1.0\ lb/hr} = pollutant\ conc\ (\mu g/m^3)$$

The results of the Tier 1 modeling analysis are presented below.

Table 24: Toxic Air Pollutants - Dispersion Modeling Analysis

Pollutant	CAS	ASIL (ug/m3)		Emission Increase (CT1 + CT2)		Increase < ASIL?
		Threshold	Avg. Time	lb/hr	ug/m3	
Acetaldehyde	75-07-0	3.70E-01	year	1.22E-02	2.25E-04	YES
Acrolein	107-02-8	3.50E-01	24-hr	1.95E-03	2.16E-04	YES
Benzene	71-43-2	1.30E-01	year	3.65E-03	6.76E-05	YES
Ethylbenzene	100-41-4	4.00E-01	year	9.73E-03	1.80E-04	YES
Formaldehyde	50-00-0	1.70E-01	year	3.24E-02	6.00E-04	YES
Propylene Oxide	75-56-9	2.70E-01	year	8.82E-03	1.63E-04	YES

All TAPs have successfully complied with the Tier 1 screening analysis after the implementation of tBACT for the combustion turbines.

4.6 WAC 463-80 – Greenhouse Gas Mitigation

WAC 463-80-030(b)(3) requires existing fossil-fueled thermal electric generating facilities seeking to modify the facility or any electrical generating units to mitigate the increase of the emission of CO_2, as described in RCW 80.70.020, when the following occur:

(a) The application was received after July 1, 2004;
(b) The unmodified station generating capability is 350 MWe or greater;
(c) The increase to the facility or units is the greater of the following measures:
    (i) An increase in station-generating capability of more than 25 MWe; or
    (ii) An increase in CO_2 emissions output by fifteen percent or more.

GHEC currently has a permitted station generating capability of 650 MWe; however, the increase in generating capability will be less than the regulatory threshold. The turbines are currently permitted with a nominal generating capacity of 175 MW each (350 MW total). The installation of AGP will increase that capacity to 181.2 MW each (362.4 MW total) at 59 degrees F and 100% load. AGP will not have any effect on the operation of the duct burners or the rated capacity of the steam turbine.

As discussed in Section 4.4, the mass emission rate (lb/hr) of CO_2 will increase by 9.1% at 59 degrees F and 100% load with the installation of AGP. This is less than the mitigation threshold. This project will not be subject to the GHG mitigation regulation.

4.7 WAC 463-85 – Greenhouse Gas Emission Performance Standard and Sequestration Plans and Programs for Baseload Electric Generating Facilities

WAC 463-85-120(1)(b) states that any existing baseload electric generation facility that engages in one of the activities listed in subsection (3) becomes subject to the emission performance standard (EPS). Those activities are the issuance of a notice of construction approval or site certification agreement for a new electric generating unit, upgrading an existing facility or unit, or

becoming subject to a new baseload electric long-term financial commitment. This project does not involve new construction, nor does it represent entering into a new long-term financial commitment/power purchase agreement. The question is whether it would be considered an upgrade to an existing unit.

WAC 463-85-110 defines "upgrade" as any modification made for the primary purpose of increasing the electric generation capacity of a baseload electric generation facility or unit. However, an upgrade does not include "installation, replacement, or modification of equipment that improves the heat rate of the facility."

The AGP installation improves the heat rate of the turbines. According to GE engineering data, the heat rate at 100% load and 59 degrees F for the existing gas turbines is 9,301 Btu/kWh. With the installation of AGP, the heat rate decreases to 9,086 Btu/kWh at the same temperature and load conditions, which constitutes an improvement of approximately 2.3%. This heat rate improvement would exclude GHEC from becoming subject to the EPS and sequestration requirements of these regulations.

5.0 State Environmental Policy Act

WAC 197-11 requires EFSEC to comply with the State Environmental Policy Act (SEPA). GHEC has submitted a SEPA Checklist along with its request for an SCA amendment and this minor modification application. The requested amendment will not result in any significant adverse effects on the environment. A copy of the SCA amendment package is provided in Appendix F.

Appendix A – NSR Emission Calculations

Table A-1: CT-1 Monthly Totals

Month	Heat Input (mmBtu)	Criteria Pollutants (lbs)							GHG Pollutants (tons)			
		PM	PM10	PM2.5	NOx	CO	SO2	VOC	CO2	CH4	N2O	CO2e
Jul-15	1,549,462	3718.71	3718.71	3718.71	9845.64	454.64	425.20	620.30	92,081.7	1.71	0.17	92,175
Aug-15	1,449,918	3479.80	3479.80	3479.80	9038.98	607.03	391.90	571.70	86,166.5	1.60	0.16	86,254
Sep-15	1,316,102	3158.64	3158.64	3158.64	8122.36	779.87	372.90	534.90	78,213.0	1.45	0.15	78,293
Oct-15	1,472,466	3533.92	3533.92	3533.92	9385.83	790.94	407.56	595.20	87,505.5	1.62	0.16	87,594
Nov-15	1,338,591	3212.62	3212.62	3212.62	8551.58	865.91	362.74	524.40	79,551.3	1.48	0.15	79,632
Dec-15	1,313,376	3152.10	3152.10	3152.10	9130.88	1087.66	357.20	515.20	78,052.3	1.45	0.14	78,132
Jan-16	1,338,315	3211.95	3211.95	3211.95	8863.67	1053.76	367.75	528.80	79,535.0	1.48	0.15	79,616
Feb-16	878,369	2108.08	2108.08	2108.08	7125.90	1066.94	242.97	351.50	52,200.6	0.97	0.10	52,254
Mar-16	431,216	1034.92	1034.92	1034.92	3605.38	706.22	225.70	170.30	25,626.6	0.48	0.05	25,653
Apr-16	340,700	817.68	817.68	817.68	3309.99	771.67	91.51	135.70	20,246.3	0.38	0.04	20,267
May-16	866,196	2078.87	2078.87	2078.87	6584.71	1180.03	229.33	345.20	51,477.2	0.95	0.10	51,529
Jun-16	553,478	1328.35	1328.35	1328.35	6013.16	1452.50	152.49	225.70	32,893.1	0.61	0.06	32,926
Jul-16	1,243,868	2985.28	2985.28	2985.28	8110.53	1278.18	333.28	500.90	73,921.0	1.37	0.14	73,996
Aug-16	1,388,549	3332.52	3332.52	3332.52	8843.54	888.50	377.99	561.00	82,519.6	1.53	0.15	82,603
Sep-16	1,377,322	3305.57	3305.57	3305.57	9481.44	809.07	382.90	556.90	81,853.0	1.52	0.15	81,936
Oct-16	596,724	1432.14	1432.14	1432.14	4221.07	679.05	167.56	236.30	35,463.1	0.66	0.07	35,499
Nov-16	299,843	719.62	719.62	719.62	3027.32	792.73	81.60	120.10	17,818.8	0.33	0.03	17,837
Dec-16	674,446	1618.67	1618.67	1618.67	5002.56	878.32	182.90	263.30	40,082.0	0.74	0.07	40,123
Jan-17	1,272,871	3054.89	3054.89	3054.89	9264.48	1499.76	346.28	497.70	75,645.1	1.40	0.14	75,722
Feb-17	673,866	1617.28	1617.28	1617.28	5585.17	1157.91	185.03	266.10	40,047.1	0.74	0.07	40,088
Mar-17	114,930	275.83	275.83	275.83	2551.77	804.66	31.17	45.00	6,830.1	0.13	0.01	6,837
Apr-17	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0
May-17	298,845	717.23	717.23	717.23	6231.29	1972.39	79.15	118.80	17,759.5	0.33	0.03	17,778
Jun-17	298,692	716.86	716.86	716.86	5851.13	1850.24	157.31	118.80	17,750.9	0.33	0.03	17,769

Table A-1: CT-1 Monthly Totals

Month	Heat Input (mmBtu)	Criteria Pollutants (lbs)							GHG Pollutants (tons)			
		PM	PM10	PM2.5	NOx	CO	SO2	VOC	CO2	CH4	N2O	CO2e
Jul-17	1,337,954	3211.09	3211.09	3211.09	8972.01	1081.82	348.60	535.10	79,514.2	1.47	0.15	79,595
Aug-17	1,509,286	3622.29	3622.29	3622.29	10085.89	799.86	396.16	604.00	89,695.6	1.66	0.17	89,787
Sep-17	1,278,775	3069.06	3069.06	3069.06	8876.91	1038.68	336.21	511.80	75,996.5	1.41	0.14	76,074
Oct-17	1,359,415	3262.60	3262.60	3262.60	10511.09	1445.46	375.25	539.30	80,786.6	1.50	0.15	80,869
Nov-17	862,202	2069.28	2069.28	2069.28	8449.69	1517.67	235.25	337.60	51,240.3	0.95	0.10	51,292
Dec-17	1,376,889	3304.53	3304.53	3304.53	10120.34	1324.01	373.38	531.60	81,827.3	1.52	0.15	81,910
Jan-18	616,661	1479.99	1479.99	1479.99	8029.54	1789.65	160.96	239.30	36,647.7	0.68	0.07	36,685
Feb-18	578,231	1387.75	1387.75	1387.75	8415.69	2007.76	302.88	223.60	34,363.7	0.64	0.06	34,399
Mar-18	1,138,024	2731.26	2731.26	2731.26	9577.59	1758.02	295.62	439.00	67,631.1	1.25	0.13	67,700
Apr-18	753,561	1808.55	1808.55	1808.55	8393.74	1767.06	390.68	292.60	44,782.8	0.83	0.08	44,828
May-18	123,060	295.34	295.34	295.34	2585.12	633.59	32.13	48.60	7,313.1	0.14	0.01	7,321
Jun-18	525,613	1261.47	1261.47	1261.47	6696.42	1426.25	137.10	208.90	31,236.1	0.58	0.06	31,268
Jul-18	1,444,792	3467.50	3467.50	3467.50	10627.23	710.66	379.93	584.40	85,861.2	1.59	0.16	85,948
Aug-18	1,520,173	3648.41	3648.41	3648.41	11045.23	782.04	1185.74	606.20	90,341.7	1.68	0.17	90,434
Sep-18	1,455,842	3494.02	3494.02	3494.02	10673.53	763.09	1147.88	586.30	86,517.9	1.60	0.16	86,606
Oct-18	505,605	1213.45	1213.45	1213.45	4233.11	536.52	131.09	198.90	30,047.3	0.56	0.06	30,078
Nov-18	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0
Dec-18	365,775	877.86	877.86	877.86	4389.22	1063.58	95.67	142.80	21,736.7	0.40	0.04	21,759
Jan-19	1,350,200	3240.48	3240.48	3240.48	9804.88	1179.29	372.15	526.70	80,241.1	1.49	0.15	80,323
Feb-19	291,537	699.69	699.69	699.69	2365.13	400.25	79.67	113.10	17,325.8	0.32	0.03	17,343
Mar-19	806,691	1936.06	1936.06	1936.06	5809.30	980.03	721.72	319.40	47,941.0	0.89	0.09	47,990
Apr-19	597,555	1434.13	1434.13	1434.13	11690.73	985.88	155.35	234.30	35,512.7	0.66	0.07	35,549
May-19	361,529	867.67	867.67	867.67	2785.27	418.45	93.29	141.60	21,484.6	0.40	0.04	21,506
Jun-19	704,088	1689.81	1689.81	1689.81	5582.63	915.54	556.23	283.50	41,842.7	0.78	0.08	41,885

Table A-1: CT-1 Monthly Totals

Month	Heat Input (mmBtu)	Criteria Pollutants (lbs)							GHG Pollutants (tons)			
		PM	PM10	PM2.5	NOx	CO	SO2	VOC	CO2	CH4	N2O	CO2e
Jul-19	1,517,427	3641.82	3641.82	3641.82	9104.67	754.99	805.60	615.50	90,177.6	1.67	0.17	90,269
Aug-19	1,568,958	3765.50	3765.50	3765.50	9831.41	734.20	418.99	627.30	93,240.3	1.73	0.17	93,335
Sep-19	1,510,766	3625.84	3625.84	3625.84	9283.16	748.69	400.33	597.70	89,780.9	1.67	0.17	89,872
Oct-19	1,252,282	9129.14	9129.14	9129.14	9133.66	1228.97	337.60	405.40	74,422.2	1.38	0.14	74,498
Nov-19	909,875	6632.99	6632.99	6632.99	6806.55	924.27	243.03	292.40	54,073.1	1.00	0.10	54,128
Dec-19	1,561,525	11383.52	11383.52	11383.52	9420.15	933.05	1222.38	492.10	92,797.1	1.72	0.17	92,891
Jan-20	1,349,853	9840.43	9840.43	9840.43	8811.63	1441.39	371.71	439.80	80,219.7	1.49	0.15	80,301
Feb-20	939,305	6847.53	6847.53	6847.53	6670.99	1327.23	258.62	306.30	55,822.0	1.04	0.10	55,879
Mar-20	1,630,878	11889.10	11889.10	11889.10	9804.37	1715.64	1269.50	520.10	96,921.1	1.80	0.18	97,020
Apr-20	1,258,282	9172.88	9172.88	9172.88	7650.19	1170.55	989.58	403.50	74,777.1	1.39	0.14	74,853
May-20	177	1.29	1.29	1.29	30.32	100.27	0.25	0.10	10.5	0.00	0.00	11
Jun-20	521	3.80	3.80	3.80	120.41	115.69	0.25	0.10	31.0	0.00	0.00	31

Notes:

1) NOX & CO emission rates derived from CEMS data.

2) PM, SO2, VOC, and CO2 emission rates derived from DAHS calculations.

3) CH4 and N2O based on 40 CFR 98 Subpart C:

CH4	0.002205	lb/mmBtu
N2O	0.00022	lb/mmBtu

Table A-2: CT-2 Monthly Totals

Month	Heat Input (mmBtu)	Criteria Pollutants (lbs)							GHG Pollutants (tons)			
		PM	PM10	PM2.5	NOx	CO	SO2	VOC	CO2	CH4	N2O	CO2e
Jul-15	1,525,139	3050.28	3050.28	3050.28	10955.17	520.78	418.70	209.40	90,636.4	1.68	0.17	90,729
Aug-15	1,437,141	2874.28	2874.28	2874.28	10218.34	631.41	387.20	186.90	85,408.2	1.58	0.16	85,495
Sep-15	1,307,327	2614.65	2614.65	2614.65	9194.28	697.43	368.60	165.20	77,693.3	1.44	0.14	77,772
Oct-15	1,455,428	2910.86	2910.86	2910.86	11015.79	388.25	407.50	192.30	86,494.1	1.60	0.16	86,582
Nov-15	1,326,281	2652.56	2652.56	2652.56	10032.80	660.15	363.13	178.30	78,817.1	1.46	0.15	78,897
Dec-15	1,295,618	2591.24	2591.24	2591.24	13554.99	851.01	355.53	176.20	76,996.1	1.43	0.14	77,074
Jan-16	1,329,726	2659.45	2659.45	2659.45	10278.71	779.62	367.17	181.20	79,024.0	1.47	0.15	79,104
Feb-16	860,661	1721.32	1721.32	1721.32	7084.64	815.78	241.00	110.20	51,148.3	0.95	0.09	51,200
Mar-16	473,386	946.77	946.77	946.77	4462.71	784.39	249.00	60.80	28,132.8	0.52	0.05	28,161
Apr-16	347,673	695.35	695.35	695.35	4094.31	867.79	93.65	44.00	20,661.8	0.38	0.04	20,683
May-16	1,056,641	2113.28	2113.28	2113.28	9271.01	788.87	285.41	140.80	62,794.0	1.16	0.12	62,858
Jun-16	296,388	592.78	592.78	592.78	3491.88	438.99	80.61	39.60	17,613.7	0.33	0.03	17,632
Jul-16	1,239,301	2478.60	2478.60	2478.60	9261.27	805.85	333.58	161.70	73,651.9	1.37	0.14	73,727
Aug-16	1,378,747	2757.49	2757.49	2757.49	10208.80	620.89	376.18	186.10	81,937.5	1.52	0.15	82,021
Sep-16	1,365,503	2731.01	2731.01	2731.01	9515.10	465.87	382.90	179.00	81,150.0	1.51	0.15	81,232
Oct-16	594,561	1189.12	1189.12	1189.12	4463.47	479.21	166.85	71.00	35,333.2	0.66	0.07	35,369
Nov-16	223,579	447.16	447.16	447.16	2558.40	603.03	61.69	27.50	13,287.0	0.25	0.02	13,300
Dec-16	882,043	1764.09	1764.09	1764.09	8390.08	1155.78	240.16	133.30	52,417.4	0.97	0.10	52,471
Jan-17	1,247,652	2495.30	2495.30	2495.30	10143.81	1043.31	339.85	188.40	74,146.2	1.38	0.14	74,222
Feb-17	635,790	1271.58	1271.58	1271.58	5558.79	792.33	174.59	99.60	37,784.7	0.70	0.07	37,823
Mar-17	105,984	211.97	211.97	211.97	1866.87	604.70	28.97	16.30	6,298.5	0.12	0.01	6,305
Apr-17	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0
May-17	267,262	534.52	534.52	534.52	5932.25	1668.05	70.78	34.40	15,883.4	0.29	0.03	15,900
Jun-17	274,555	549.11	549.11	549.11	4162.63	1072.96	144.60	35.60	16,317.1	0.30	0.03	16,334

Table A-2: CT-2 Monthly Totals

Month	Heat Input (mmBtu)	Criteria Pollutants (lbs)							GHG Pollutants (tons)			
		PM	PM10	PM2.5	NOx	CO	SO2	VOC	CO2	CH4	N2O	CO2e
Jul-17	1,286,595	2573.19	2573.19	2573.19	9336.92	530.67	335.22	166.00	76,462.1	1.42	0.14	76,540
Aug-17	1,480,991	2961.98	2961.98	2961.98	10630.57	374.43	388.74	196.80	88,013.3	1.63	0.16	88,103
Sep-17	1,277,367	2554.73	2554.73	2554.73	9127.40	685.10	335.85	165.60	75,913.1	1.41	0.14	75,990
Oct-17	1,349,364	2698.73	2698.73	2698.73	9889.44	763.05	374.32	187.50	80,191.6	1.49	0.15	80,273
Nov-17	839,189	1678.38	1678.38	1678.38	6716.85	767.25	230.25	124.60	49,870.5	0.93	0.09	49,921
Dec-17	1,375,639	2751.28	2751.28	2751.28	9857.27	783.97	373.57	215.60	81,752.9	1.52	0.15	81,836
Jan-18	589,361	1178.72	1178.72	1178.72	5766.14	680.96	153.83	90.50	35,025.2	0.65	0.06	35,061
Feb-18	548,322	1096.64	1096.64	1096.64	5679.11	933.31	287.22	80.90	32,587.4	0.60	0.06	32,620
Mar-18	1,114,769	2229.54	2229.54	2229.54	8921.16	774.89	289.58	160.90	66,249.3	1.23	0.12	66,317
Apr-18	773,008	1546.02	1546.02	1546.02	7488.94	784.71	400.76	105.00	45,938.9	0.85	0.09	45,986
May-18	124,881	249.76	249.76	249.76	2002.69	383.96	32.61	17.10	7,421.5	0.14	0.01	7,429
Jun-18	554,019	1108.04	1108.04	1108.04	7236.96	1109.97	144.50	74.80	32,924.9	0.61	0.06	32,958
Jul-18	1,437,401	2874.80	2874.80	2874.80	10865.30	377.28	377.99	193.60	85,423.5	1.58	0.16	85,510
Aug-18	1,498,011	2996.02	2996.02	2996.02	11040.57	355.08	1168.45	201.80	89,024.8	1.65	0.17	89,115
Sep-18	1,467,099	2934.20	2934.20	2934.20	10507.45	272.26	1156.76	197.40	87,188.3	1.62	0.16	87,277
Oct-18	457,802	915.60	915.60	915.60	4256.49	332.55	118.69	64.00	27,206.0	0.50	0.05	27,234
Nov-18	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0
Dec-18	482,887	965.77	965.77	965.77	6833.95	1043.65	126.30	65.50	28,697.1	0.53	0.05	28,726
Jan-19	1,382,853	2765.71	2765.71	2765.71	9706.07	751.35	381.90	202.70	82,182.7	1.52	0.15	82,266
Feb-19	293,588	587.18	587.18	587.18	2706.35	332.74	80.39	45.90	17,446.8	0.32	0.03	17,465
Mar-19	893,688	1787.38	1787.38	1787.38	8652.75	1122.08	771.36	125.40	53,110.4	0.99	0.10	53,164
Apr-19	621,639	1243.28	1243.28	1243.28	13443.35	795.12	161.61	80.10	36,943.4	0.69	0.07	36,981
May-19	398,665	797.33	797.33	797.33	3333.05	247.82	102.88	50.90	23,692.9	0.44	0.04	23,717
Jun-19	678,725	1357.45	1357.45	1357.45	8513.60	722.43	536.19	87.30	40,336.5	0.75	0.07	40,378

Table A-2: CT-2 Monthly Totals

Month	Heat Input (mmBtu)	Criteria Pollutants (lbs)							GHG Pollutants (tons)			
		PM	PM10	PM2.5	NOx	CO	SO2	VOC	CO2	CH4	N2O	CO2e
Jul-19	1,473,739	2947.48	2947.48	2947.48	10498.77	302.47	764.77	197.90	87,581.7	1.62	0.16	87,671
Aug-19	1,531,181	3062.36	3062.36	3062.36	10133.79	249.74	415.25	208.60	90,995.9	1.69	0.17	91,088
Sep-19	1,489,670	2979.34	2979.34	2979.34	8948.55	329.22	402.40	196.50	88,528.0	1.64	0.16	88,618
Oct-19	1,137,112	7709.62	7709.62	7709.62	8316.16	916.89	305.67	355.90	67,575.6	1.25	0.13	67,644
Nov-19	887,981	6020.51	6020.51	6020.51	5928.94	593.60	236.45	279.70	52,771.8	0.98	0.10	52,825
Dec-19	1,566,103	10618.18	10618.18	10618.18	9534.56	458.34	1221.98	488.30	93,071.7	1.73	0.17	93,166
Jan-20	440,141	2984.15	2984.15	2984.15	3068.85	418.31	120.77	141.40	26,157.5	0.49	0.05	26,184
Feb-20	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0
Mar-20	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0
Apr-20	808,537	5481.88	5481.88	5481.88	6965.36	651.74	638.16	240.70	48,051.2	0.89	0.09	48,100
May-20	179	1.21	1.21	1.21	27.13	72.79	0.25	0.00	10.6	0.00	0.00	11
Jun-20	27,634	187.36	187.36	187.36	528.53	165.80	14.50	8.40	1,642.4	0.03	0.00	1,644

Notes:

1) NOX & CO emission rates derived from CEMS data.

2) PM, SO2, VOC, and CO2 emission rates derived from DAHS calculations.

3) CH4 and N2O based on 40 CFR 98 Subpart C:

CH4	0.002205	lb/mmBtu
N2O	0.00022	lb/mmBtu

Table A-3: Baseline Actual Emissions Calculations

	CT1 Emissions (tons)								CT2 Emissions (tons)							
Month	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Jul-15	1.86	1.86	1.86	4.92	0.23	0.21	0.31	92,175	1.53	1.53	1.53	5.48	0.26	0.21	0.10	90,729
Aug-15	1.74	1.74	1.74	4.52	0.30	0.20	0.29	86,254	1.44	1.44	1.44	5.11	0.32	0.19	0.09	85,495
Sep-15	1.58	1.58	1.58	4.06	0.39	0.19	0.27	78,293	1.31	1.31	1.31	4.60	0.35	0.18	0.08	77,772
Oct-15	1.77	1.77	1.77	4.69	0.40	0.20	0.30	87,594	1.46	1.46	1.46	5.51	0.19	0.20	0.10	86,582
Nov-15	1.61	1.61	1.61	4.28	0.43	0.18	0.26	79,632	1.33	1.33	1.33	5.02	0.33	0.18	0.09	78,897
Dec-15	1.58	1.58	1.58	4.57	0.54	0.18	0.26	78,132	1.30	1.30	1.30	6.78	0.43	0.18	0.09	77,074
Jan-16	1.61	1.61	1.61	4.43	0.53	0.18	0.26	79,616	1.33	1.33	1.33	5.14	0.39	0.18	0.09	79,104
Feb-16	1.05	1.05	1.05	3.56	0.53	0.12	0.18	52,254	0.86	0.86	0.86	3.54	0.41	0.12	0.06	51,200
Mar-16	0.52	0.52	0.52	1.80	0.35	0.11	0.09	25,653	0.47	0.47	0.47	2.23	0.39	0.12	0.03	28,161
Apr-16	0.41	0.41	0.41	1.65	0.39	0.05	0.07	20,267	0.35	0.35	0.35	2.05	0.43	0.05	0.02	20,683
May-16	1.04	1.04	1.04	3.29	0.59	0.11	0.17	51,529	1.06	1.06	1.06	4.64	0.39	0.14	0.07	62,858
Jun-16	0.66	0.66	0.66	3.01	0.73	0.08	0.11	32,926	0.30	0.30	0.30	1.75	0.22	0.04	0.02	17,632
Jul-16	1.49	1.49	1.49	4.06	0.64	0.17	0.25	73,996	1.24	1.24	1.24	4.63	0.40	0.17	0.08	73,727
Aug-16	1.67	1.67	1.67	4.42	0.44	0.19	0.28	82,603	1.38	1.38	1.38	5.10	0.31	0.19	0.09	82,021
Sep-16	1.65	1.65	1.65	4.74	0.40	0.19	0.28	81,936	1.37	1.37	1.37	4.76	0.23	0.19	0.09	81,232
Oct-16	0.72	0.72	0.72	2.11	0.34	0.08	0.12	35,499	0.59	0.59	0.59	2.23	0.24	0.08	0.04	35,369
Nov-16	0.36	0.36	0.36	1.51	0.40	0.04	0.06	17,837	0.22	0.22	0.22	1.28	0.30	0.03	0.01	13,300
Dec-16	0.81	0.81	0.81	2.50	0.44	0.09	0.13	40,123	0.88	0.88	0.88	4.20	0.58	0.12	0.07	52,471
Jan-17	1.53	1.53	1.53	4.63	0.75	0.17	0.25	75,722	1.25	1.25	1.25	5.07	0.52	0.17	0.09	74,222
Feb-17	0.81	0.81	0.81	2.79	0.58	0.09	0.13	40,088	0.64	0.64	0.64	2.78	0.40	0.09	0.05	37,823
Mar-17	0.14	0.14	0.14	1.28	0.40	0.02	0.02	6,837	0.11	0.11	0.11	0.93	0.30	0.01	0.01	6,305
Apr-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
May-17	0.36	0.36	0.36	3.12	0.99	0.04	0.06	17,778	0.27	0.27	0.27	2.97	0.83	0.04	0.02	15,900
Jun-17	0.36	0.36	0.36	2.93	0.93	0.08	0.06	17,769	0.27	0.27	0.27	2.08	0.54	0.07	0.02	16,334
Jul-17	1.61	1.61	1.61	4.49	0.54	0.17	0.27	79,595	1.29	1.29	1.29	4.67	0.27	0.17	0.08	76,540
Aug-17	1.81	1.81	1.81	5.04	0.40	0.20	0.30	89,787	1.48	1.48	1.48	5.32	0.19	0.19	0.10	88,103
Sep-17	1.53	1.53	1.53	4.44	0.52	0.17	0.26	76,074	1.28	1.28	1.28	4.56	0.34	0.17	0.08	75,990
Oct-17	1.63	1.63	1.63	5.26	0.72	0.19	0.27	80,869	1.35	1.35	1.35	4.94	0.38	0.19	0.09	80,273
Nov-17	1.03	1.03	1.03	4.22	0.76	0.12	0.17	51,292	0.84	0.84	0.84	3.36	0.38	0.12	0.06	49,921
Dec-17	1.65	1.65	1.65	5.06	0.66	0.19	0.27	81,910	1.38	1.38	1.38	4.93	0.39	0.19	0.11	81,836
Jan-18	0.74	0.74	0.74	4.01	0.89	0.08	0.12	36,685	0.59	0.59	0.59	2.88	0.34	0.08	0.05	35,061
Feb-18	0.69	0.69	0.69	4.21	1.00	0.15	0.11	34,399	0.55	0.55	0.55	2.84	0.47	0.14	0.04	32,620
Mar-18	1.37	1.37	1.37	4.79	0.88	0.15	0.22	67,700	1.11	1.11	1.11	4.46	0.39	0.14	0.08	66,317
Apr-18	0.90	0.90	0.90	4.20	0.88	0.20	0.15	44,828	0.77	0.77	0.77	3.74	0.39	0.20	0.05	45,986
May-18	0.15	0.15	0.15	1.29	0.32	0.02	0.02	7,321	0.12	0.12	0.12	1.00	0.19	0.02	0.01	7,429
Jun-18	0.63	0.63	0.63	3.35	0.71	0.07	0.10	31,268	0.55	0.55	0.55	3.62	0.55	0.07	0.04	32,958
Jul-18	1.73	1.73	1.73	5.31	0.36	0.19	0.29	85,948	1.44	1.44	1.44	5.43	0.19	0.19	0.10	85,510
Aug-18	1.82	1.82	1.82	5.52	0.39	0.59	0.30	90,434	1.50	1.50	1.50	5.52	0.18	0.58	0.10	89,115
Sep-18	1.75	1.75	1.75	5.34	0.38	0.57	0.29	86,606	1.47	1.47	1.47	5.25	0.14	0.58	0.10	87,277
Oct-18	0.61	0.61	0.61	2.12	0.27	0.07	0.10	30,078	0.46	0.46	0.46	2.13	0.17	0.06	0.03	27,234
Nov-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Dec-18	0.44	0.44	0.44	2.19	0.53	0.05	0.07	21,759	0.48	0.48	0.48	3.42	0.52	0.06	0.03	28,726
Jan-19	1.62	1.62	1.62	4.90	0.59	0.19	0.26	80,323	1.38	1.38	1.38	4.85	0.38	0.19	0.10	82,266
Feb-19	0.35	0.35	0.35	1.18	0.20	0.04	0.06	17,343	0.29	0.29	0.29	1.35	0.17	0.04	0.02	17,465

Table A-3: Baseline Actual Emissions Calculations

	CT1 Emissions (tons)								CT2 Emissions (tons)							
Month	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Mar-19	0.97	0.97	0.97	2.90	0.49	0.36	0.16	47,990	0.89	0.89	0.89	4.33	0.56	0.39	0.06	53,164
Apr-19	0.72	0.72	0.72	5.85	0.49	0.08	0.12	35,549	0.62	0.62	0.62	6.72	0.40	0.08	0.04	36,981
May-19	0.43	0.43	0.43	1.39	0.21	0.05	0.07	21,506	0.40	0.40	0.40	1.67	0.12	0.05	0.03	23,717
Jun-19	0.84	0.84	0.84	2.79	0.46	0.28	0.14	41,885	0.68	0.68	0.68	4.26	0.36	0.27	0.04	40,378
Jul-19	1.82	1.82	1.82	4.55	0.38	0.40	0.31	90,269	1.47	1.47	1.47	5.25	0.15	0.38	0.10	87,671
Aug-19	1.88	1.88	1.88	4.92	0.37	0.21	0.31	93,335	1.53	1.53	1.53	5.07	0.12	0.21	0.10	91,088
Sep-19	1.81	1.81	1.81	4.64	0.37	0.20	0.30	89,872	1.49	1.49	1.49	4.47	0.16	0.20	0.10	88,618
Oct-19	4.56	4.56	4.56	4.57	0.61	0.17	0.20	74,498	3.85	3.85	3.85	4.16	0.46	0.15	0.18	67,644
Nov-19	3.32	3.32	3.32	3.40	0.46	0.12	0.15	54,128	3.01	3.01	3.01	2.96	0.30	0.12	0.14	52,825
Dec-19	5.69	5.69	5.69	4.71	0.47	0.61	0.25	92,891	5.31	5.31	5.31	4.77	0.23	0.61	0.24	93,166
Jan-20	4.92	4.92	4.92	4.41	0.72	0.19	0.22	80,301	1.49	1.49	1.49	1.53	0.21	0.06	0.07	26,184
Feb-20	3.42	3.42	3.42	3.34	0.66	0.13	0.15	55,879	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Mar-20	5.94	5.94	5.94	4.90	0.86	0.63	0.26	97,020	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Apr-20	4.59	4.59	4.59	3.83	0.59	0.49	0.20	74,853	2.74	2.74	2.74	3.48	0.33	0.32	0.12	48,100
May-20	0.00	0.00	0.00	0.02	0.05	0.00	0.00	11	0.00	0.00	0.00	0.01	0.04	0.00	0.00	11
Jun-20	0.00	0.00	0.00	0.06	0.06	0.00	0.00	31	0.09	0.09	0.09	0.26	0.08	0.01	0.00	1,644

Table A-3: Baseline Actual Emissions Calculations

	Total Emissions (tons)								24-month Annual Avg. Emissions (tons)							
Month	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Jul-15	3.39	3.39	3.39	10.40	0.49	0.42	0.41	182,904								
Aug-15	3.18	3.18	3.18	9.63	0.62	0.39	0.38	171,749								
Sep-15	2.89	2.89	2.89	8.66	0.74	0.37	0.35	156,065								
Oct-15	3.23	3.23	3.23	10.20	0.59	0.40	0.40	174,176								
Nov-15	2.94	2.94	2.94	9.30	0.76	0.36	0.35	158,529								
Dec-15	2.88	2.88	2.88	11.35	0.97	0.36	0.35	155,206								
Jan-16	2.94	2.94	2.94	9.57	0.92	0.36	0.35	158,720								
Feb-16	1.91	1.91	1.91	7.10	0.94	0.24	0.24	103,454								
Mar-16	0.99	0.99	0.99	4.03	0.74	0.23	0.12	53,814								
Apr-16	0.76	0.76	0.76	3.70	0.82	0.10	0.09	40,950								
May-16	2.10	2.10	2.10	7.93	0.98	0.25	0.24	114,387								
Jun-16	0.96	0.96	0.96	4.76	0.95	0.12	0.13	50,558								
Jul-16	2.73	2.73	2.73	8.69	1.04	0.34	0.33	147,723								
Aug-16	3.05	3.05	3.05	9.52	0.75	0.38	0.37	164,624								
Sep-16	3.02	3.02	3.02	9.50	0.63	0.38	0.37	163,168								
Oct-16	1.31	1.31	1.31	4.34	0.58	0.16	0.16	70,868								
Nov-16	0.58	0.58	0.58	2.79	0.70	0.07	0.07	31,137								
Dec-16	1.69	1.69	1.69	6.70	1.02	0.21	0.20	92,594								
Jan-17	2.78	2.78	2.78	9.70	1.27	0.34	0.34	149,944								
Feb-17	1.45	1.45	1.45	5.57	0.98	0.18	0.18	77,911								
Mar-17	0.25	0.25	0.25	2.21	0.70	0.03	0.03	13,142								
Apr-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0								
May-17	0.63	0.63	0.63	6.09	1.82	0.08	0.08	33,678								
Jun-17	0.63	0.63	0.63	5.01	1.47	0.15	0.08	34,103	23.15	23.15	23.15	83.38	10.24	2.96	2.81	1,249,702
Jul-17	2.90	2.90	2.90	9.16	0.81	0.34	0.35	156,135	22.90	22.90	22.90	82.76	10.40	2.92	2.78	1,236,318
Aug-17	3.29	3.29	3.29	10.36	0.59	0.39	0.40	177,890	22.96	22.96	22.96	83.12	10.39	2.92	2.79	1,239,388
Sep-17	2.81	2.81	2.81	9.00	0.86	0.34	0.34	152,064	22.92	22.92	22.92	83.29	10.45	2.91	2.79	1,237,388
Oct-17	2.98	2.98	2.98	10.20	1.10	0.38	0.36	161,142	22.79	22.79	22.79	83.29	10.70	2.90	2.77	1,230,871
Nov-17	1.87	1.87	1.87	7.58	1.14	0.24	0.23	101,213	22.26	22.26	22.26	82.43	10.89	2.84	2.71	1,202,213
Dec-17	3.03	3.03	3.03	9.99	1.05	0.38	0.38	163,746	22.33	22.33	22.33	81.75	10.93	2.85	2.72	1,206,483
Jan-18	1.33	1.33	1.33	6.89	1.23	0.16	0.17	71,746	21.53	21.53	21.53	80.41	11.09	2.75	2.63	1,162,996
Feb-18	1.24	1.24	1.24	7.05	1.47	0.29	0.15	67,019	21.19	21.19	21.19	80.39	11.35	2.77	2.59	1,144,778
Mar-18	2.48	2.48	2.48	9.25	1.27	0.29	0.30	134,017	21.94	21.94	21.94	83.00	11.62	2.80	2.68	1,184,880
Apr-18	1.67	1.67	1.67	7.94	1.27	0.40	0.20	90,814	22.39	22.39	22.39	85.12	11.84	2.95	2.73	1,209,812
May-18	0.27	0.27	0.27	2.29	0.51	0.04	0.03	14,750	21.48	21.48	21.48	82.30	11.61	2.85	2.63	1,159,993
Jun-18	1.18	1.18	1.18	6.97	1.26	0.14	0.14	64,226	21.59	21.59	21.59	83.40	11.76	2.86	2.63	1,166,827
Jul-18	3.17	3.17	3.17	10.74	0.55	0.38	0.39	171,458	21.81	21.81	21.81	84.43	11.52	2.88	2.66	1,178,695
Aug-18	3.32	3.32	3.32	11.04	0.57	1.17	0.40	179,549	21.94	21.94	21.94	85.19	11.43	3.27	2.68	1,186,157
Sep-18	3.22	3.22	3.22	10.59	0.52	1.15	0.39	173,883	22.04	22.04	22.04	85.73	11.37	3.66	2.69	1,191,515
Oct-18	1.07	1.07	1.07	4.25	0.44	0.13	0.13	57,312	21.92	21.92	21.92	85.69	11.30	3.64	2.67	1,184,737
Nov-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	21.63	21.63	21.63	84.29	10.95	3.61	2.64	1,169,168
Dec-18	0.92	0.92	0.92	5.61	1.05	0.11	0.10	50,485	21.25	21.25	21.25	83.75	10.97	3.56	2.59	1,148,114
Jan-19	3.00	3.00	3.00	9.75	0.97	0.38	0.36	162,589	21.36	21.36	21.36	83.77	10.82	3.58	2.60	1,154,436
Feb-19	0.64	0.64	0.64	2.53	0.37	0.08	0.08	34,808	20.95	20.95	20.95	82.25	10.51	3.53	2.55	1,132,885

Table A-3: Baseline Actual Emissions Calculations

	Total Emissions (tons)								24-month Annual Avg. Emissions (tons)							
Month	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Mar-19	1.86	1.86	1.86	7.23	1.05	0.75	0.22	101,154	21.76	21.76	21.76	84.76	10.69	3.89	2.64	1,176,891
Apr-19	1.34	1.34	1.34	12.57	0.89	0.16	0.16	72,530	22.43	22.43	22.43	91.05	11.13	3.97	2.72	1,213,156
May-19	0.83	0.83	0.83	3.06	0.33	0.10	0.10	45,223	22.53	22.53	22.53	89.53	10.39	3.98	2.73	1,218,928
Jun-19	1.52	1.52	1.52	7.05	0.82	0.55	0.18	82,263	22.97	22.97	22.97	90.55	10.06	4.18	2.78	1,243,008
Jul-19	3.29	3.29	3.29	9.80	0.53	0.78	0.41	177,940	23.17	23.17	23.17	90.87	9.92	4.40	2.81	1,253,911
Aug-19	3.41	3.41	3.41	9.99	0.49	0.42	0.41	184,423	23.23	23.23	23.23	90.69	9.87	4.41	2.82	1,257,177
Sep-19	3.30	3.30	3.30	9.11	0.53	0.40	0.40	178,490	23.47	23.47	23.47	90.74	9.71	4.44	2.85	1,270,390
Oct-19	8.41	8.41	8.41	8.73	1.07	0.32	0.38	142,142	26.19	26.19	26.19	90.01	9.69	4.41	2.86	1,260,890
Nov-19	6.33	6.33	6.33	6.36	0.76	0.24	0.29	106,953	28.42	28.42	28.42	89.40	9.50	4.41	2.89	1,263,760
Dec-19	11.00	11.00	11.00	9.48	0.70	1.22	0.49	186,057	32.40	32.40	32.40	89.14	9.33	4.83	2.94	1,274,916
Jan-20	6.41	6.41	6.41	5.94	0.93	0.25	0.29	106,485	34.94	34.94	34.94	88.67	9.18	4.88	3.00	1,292,285
Feb-20	3.42	3.42	3.42	3.34	0.66	0.13	0.15	55,879	36.03	36.03	36.03	86.81	8.77	4.80	3.00	1,286,715
Mar-20	5.94	5.94	5.94	4.90	0.86	0.63	0.26	97,020	37.76	37.76	37.76	84.64	8.57	4.97	2.98	1,268,217
Apr-20	7.33	7.33	7.33	7.31	0.92	0.81	0.32	122,953	40.59	40.59	40.59	84.32	8.39	5.17	3.04	1,284,286
May-20	0.00	0.00	0.00	0.03	0.09	0.00	0.00	22	40.46	40.46	40.46	83.19	8.18	5.15	3.03	1,276,922
Jun-20	0.09	0.09	0.09	0.32	0.14	0.01	0.00	1,675	39.91	39.91	39.91	79.87	7.62	5.09	2.96	1,245,647
								BAE	40.59	40.59	40.59	91.05	11.84	5.17	3.04	1,292,285

*BAE is the max 24-month average during the 5-year period prior to January 2020.

**Both emission units must use the same 24-month period for each pollutant, but a different period can be used for each pollutant.

Table A-4: Baseline Period Emission Factors

			CT1						CT2					
			Baseline Heat Input (mmBtu)		Baseline Emissions (lbs)		Baseline EF (lb/mmBtu)		Baseline Heat Input (mmBtu)		Baseline Emissions (lbs)		Baseline EF (lb/mmBtu)	
Pollutant	BAE (ton/yr)	Baseline Period	Normal	SUSD	Normal	SUSD	Normal	SUSD	Normal	SUSD	Normal	SUSD	Normal	SUSD
PM	40.59	5/18 - 4/20	23,284,921	266,691	98,921.66	1,132.99	0.0042	0.0042	19,435,972	189,748	61,782.87	603.17	0.0032	0.0032
PM10	40.59	5/18 - 4/20	23,284,921	266,691	98,921.66	1,132.99	0.0042	0.0042	19,435,972	189,748	61,782.87	603.17	0.0032	0.0032
PM2.5	40.59	5/18 - 4/20	23,284,921	266,691	98,921.66	1,132.99	0.0042	0.0042	19,435,972	189,748	61,782.87	603.17	0.0032	0.0032
NOX	91.05	5/17 - 4/19	20,046,807	348,570	139,096.18	44,338.64	0.0069	0.1272	20,109,427	280,860	146,251.35	34,509.28	0.0073	0.1229
CO	11.84	5/16 - 4/18	20,136,323	334,303	14,903.83	14,869.50	0.0007	0.0445	19,944,221	258,388	8,504.19	9,113.99	0.0004	0.0353
SO2	5.17	5/18 - 4/20	23,284,921	266,691	11,311.53	93.74	0.0005	0.0004	19,435,972	189,748	9,190.49	74.58	0.0005	0.0004
VOC	3.04	5/18 - 4/20	23,284,921	266,691	8,600.20	94.60	0.0004	0.0004	19,435,972	189,748	3,484.90	30.60	0.0002	0.0002
CO2e	1,292,285	2/18 - 1/20	21,913,127	279,836	2,607,165,970	33,296,264	118.98	118.98	21,021,102	232,180	2,501,055,731	27,625,112	118.98	118.98

Notes:

1) The 5-year lookback period for actual emissions is July 2015 through June 2020.

2) BAE is total emissions for CT1 and CT2 during the baseline period.

Table A-5: Grays Harbor Energy Center Projected Operations

Scenario 1 - Projected Operations Without AGP Upgrade

Year	Projected Hours			Projected Heat Input (mmBtu/yr)		
	Total	Normal	SUSD	Total	Normal	SUSD
2022	13,240	12,992	248	28,334,374	28,123,574	210,800
2023	13,621	13,385	236	29,411,870	29,211,270	200,600
2024	13,621	13,385	236	29,411,870	29,211,270	200,600
2025	13,621	13,385	236	29,411,870	29,211,270	200,600
2026	13,621	13,385	236	29,411,870	29,211,270	200,600
2027	13,621	13,385	236	29,411,870	29,211,270	200,600
2028	13,621	13,385	236	29,411,870	29,211,270	200,600
2029	13,621	13,385	236	29,411,870	29,211,270	200,600

Scenario 2 - Projected Operations With AGP Upgrade

Year	Projected Hours			Projected Heat Input (mmBtu/yr)		
	Total	Normal	SUSD	Total	Normal	SUSD
2022	13,703	13,439	264	30,530,288	30,305,888	224,400
2023	14,098	13,846	252	31,691,290	31,477,090	214,200
2024	14,098	13,846	252	31,691,290	31,477,090	214,200
2025	14,098	13,846	252	31,691,290	31,477,090	214,200
2026	14,098	13,846	252	31,691,290	31,477,090	214,200
2027	14,098	13,846	252	31,691,290	31,477,090	214,200
2028	14,098	13,846	252	31,691,290	31,477,090	214,200
2029	14,098	13,846	252	31,691,290	31,477,090	214,200

Notes:

1) All projected operations are the total for both turbines.
2) Heat input includes duct burner operations.
3) Projections after 2029 are not expected to increase.

Projected Emission Factors (lb/mmBtu)

	Normal	SUSD
PM	0.0042	0.0042
PM10	0.0042	0.0042
PM2.5	0.0042	0.0042
NOx	0.0073	0.1272
CO	0.0007	0.0445
SO2	0.0005	0.0004
VOC	0.0004	0.0004
CO2e	118.98	118.98

Notes:

1) Worst-case baseline emission factor between CT1 and CT2.
2) According to GE data, uncontrolled emission rates will remain the same after the modification.
3) The SCR catalyst bed will be able to accommodate the slight increase in NOx mass flow.
4) NOx and CO controlled emission rates will remain the same after the modification.

Table A-6: Post-Modification Projected Emissions Rates

	Normal Operations									SUSD Operations								
	HI (mmBtu/yr)	PM (ton/yr)	PM10 (ton/yr)	PM2.5 (ton/yr)	NOx (ton/yr)	CO (ton/yr)	SO2 (ton/yr)	VOC (ton/yr)	CO2e (ton/yr)	HI (mmBtu/yr)	PM (ton/yr)	PM10 (ton/yr)	PM2.5 (ton/yr)	NOx (ton/yr)	CO (ton/yr)	SO2 (ton/yr)	VOC (ton/yr)	CO2e (ton/yr)
2022	30,305,888	64.37	64.37	64.37	110.20	11.22	7.36	5.60	1,802,872	224,400	0.48	0.48	0.48	14.27	4.99	0.04	0.04	13,350
2023	31,477,090	66.86	66.86	66.86	114.46	11.65	7.65	5.81	1,872,546	214,200	0.45	0.45	0.45	13.62	4.76	0.04	0.04	12,743
2024	31,477,090	66.86	66.86	66.86	114.46	11.65	7.65	5.81	1,872,546	214,200	0.45	0.45	0.45	13.62	4.76	0.04	0.04	12,743
2025	31,477,090	66.86	66.86	66.86	114.46	11.65	7.65	5.81	1,872,546	214,200	0.45	0.45	0.45	13.62	4.76	0.04	0.04	12,743
2026	31,477,090	66.86	66.86	66.86	114.46	11.65	7.65	5.81	1,872,546	214,200	0.45	0.45	0.45	13.62	4.76	0.04	0.04	12,743
2027	31,477,090	66.86	66.86	66.86	114.46	11.65	7.65	5.81	1,872,546	214,200	0.45	0.45	0.45	13.62	4.76	0.04	0.04	12,743
2028	31,477,090	66.86	66.86	66.86	114.46	11.65	7.65	5.81	1,872,546	214,200	0.45	0.45	0.45	13.62	4.76	0.04	0.04	12,743
2029	31,477,090	66.86	66.86	66.86	114.46	11.65	7.65	5.81	1,872,546	214,200	0.45	0.45	0.45	13.62	4.76	0.04	0.04	12,743

	Projected Actual Emissions							
	PM (ton/yr)	PM10 (ton/yr)	PM2.5 (ton/yr)	NOx (ton/yr)	CO (ton/yr)	SO2 (ton/yr)	VOC (ton/yr)	CO2e (ton/yr)
2022	64.85	64.85	64.85	124.47	16.21	7.4	5.64	1,816,222
2023	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
2024	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
2025	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
2026	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
2027	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
2028	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
2029	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289

Table A-7: Demand Growth Exclusion Calculation

	Total Emissions (tons)								2-Month Average Emissions (tons/mo)							
	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e
Month 1	0.27	0.27	0.27	6.09	0.98	0.04	0.03	67,019	--	--	--	--	--	--	--	--
Month 2	1.18	1.18	1.18	5.01	0.95	0.14	0.14	134,017	0.73	0.73	0.73	5.55	0.97	0.09	0.09	100,518
Month 3	3.17	3.17	3.17	9.16	1.04	0.38	0.39	90,814	2.18	2.18	2.18	7.09	1.00	0.26	0.27	112,416
Month 4	3.32	3.32	3.32	10.36	0.75	1.17	0.40	14,750	3.25	3.25	3.25	9.76	0.90	0.78	0.40	52,782
Month 5	3.22	3.22	3.22	9.00	0.63	1.15	0.39	64,226	3.27	3.27	3.27	9.68	0.69	1.16	0.40	39,488
Month 6	1.07	1.07	1.07	10.20	0.58	0.13	0.13	171,458	2.15	2.15	2.15	9.60	0.61	0.64	0.26	117,842
Month 7	0.00	0.00	0.00	7.58	0.70	0.00	0.00	179,549	0.54	0.54	0.54	8.89	0.64	0.07	0.07	175,504
Month 8	0.92	0.92	0.92	9.99	1.02	0.11	0.10	173,883	0.46	0.46	0.46	8.79	0.86	0.06	0.05	176,716
Month 9	3.00	3.00	3.00	6.89	1.27	0.38	0.36	57,312	1.96	1.96	1.96	8.44	1.15	0.25	0.23	115,598
Month 10	0.64	0.64	0.64	7.05	0.98	0.08	0.08	0	1.82	1.82	1.82	6.97	1.13	0.23	0.22	28,656
Month 11	1.86	1.86	1.86	9.25	0.70	0.75	0.22	50,485	1.25	1.25	1.25	8.15	0.84	0.42	0.15	25,243
Month 12	1.34	1.34	1.34	7.94	0.00	0.16	0.16	162,589	1.60	1.60	1.60	8.60	0.35	0.46	0.19	106,537
Month 13	0.83	0.83	0.83	2.29	1.82	0.10	0.10	34,808	1.09	1.09	1.09	5.12	0.91	0.13	0.13	98,699
Month 14	1.52	1.52	1.52	6.97	1.47	0.55	0.18	101,154	1.18	1.18	1.18	4.63	1.65	0.33	0.14	67,981
Month 15	3.29	3.29	3.29	10.74	0.81	0.78	0.41	72,530	2.41	2.41	2.41	8.86	1.14	0.67	0.30	86,842
Month 16	3.41	3.41	3.41	11.04	0.59	0.42	0.41	45,223	3.35	3.35	3.35	10.89	0.70	0.60	0.41	58,877
Month 17	3.30	3.30	3.30	10.59	0.86	0.40	0.40	82,263	3.36	3.36	3.36	10.82	0.73	0.41	0.41	63,743
Month 18	8.41	8.41	8.41	4.25	1.10	0.32	0.38	177,940	5.86	5.86	5.86	7.42	0.98	0.36	0.39	130,102
Month 19	6.33	6.33	6.33	0.00	1.14	0.24	0.29	184,423	7.37	7.37	7.37	2.13	1.12	0.28	0.34	181,182
Month 20	11.00	11.00	11.00	5.61	1.05	1.22	0.49	178,490	8.67	8.67	8.67	2.81	1.10	0.73	0.39	181,457
Month 21	6.41	6.41	6.41	9.75	1.23	0.25	0.29	142,142	8.71	8.71	8.71	7.68	1.14	0.74	0.39	160,316
Month 22	3.42	3.42	3.42	2.53	1.47	0.13	0.15	106,953	4.92	4.92	4.92	6.14	1.35	0.19	0.22	124,548
Month 23	5.94	5.94	5.94	7.23	1.27	0.63	0.26	186,057	4.68	4.68	4.68	4.88	1.37	0.38	0.21	146,505
Month 24	7.33	7.33	7.33	12.57	1.27	0.81	0.32	106,485	6.64	6.64	6.64	9.90	1.27	0.72	0.29	146,271

	Demand Growth Exclusion								
	PM	PM10	PM2.5	NOX	CO	SO2	VOC	CO2e	
Max Rate	8.71	8.71	8.71	10.89	1.65	1.16	0.41	181,457	ton/mo
Annual	104.52	104.52	104.52	130.68	19.80	13.92	4.92	2,177,478	ton/yr

Notes:

1) Monthly emissions are from the baseline period indicated in Table A-4.

Table A-8: NSR Analysis

	PM (ton/yr)	PM10 (ton/yr)	PM2.5 (ton/yr)	NOx (ton/yr)	CO (ton/yr)	SO2 (ton/yr)	VOC (ton/yr)	CO2e (ton/yr)
Max Projected Emissions	67.31	67.31	67.31	128.08	16.41	7.69	5.85	1,885,289
Reasonable Accommodation	104.52	104.52	104.52	130.68	19.80	13.92	4.92	2,177,478
PAE	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0
BAE	40.59	40.59	40.59	91.05	11.84	5.17	3.04	1,292,285
Emission Increase	-40.59	-40.59	-40.59	-91.05	-11.84	-5.17	-2.11	-1,292,285
Significant?	NO	NO	NO	NO	NO	NO	NO	NO
Contemporaneous Changes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
NEI	-40.59	-40.59	-40.59	-91.05	-11.84	-5.17	-2.11	-1,292,285
Significant?	NO	NO	NO	NO	NO	NO	NO	NO
SER	25	15	10	40	100	40	40	75,000

Table A-9: HAP Emissions

	Current	Post-Mod
CT Heat Input (mmBtu/hr)	1671	1823
DB Heat Input (mmBtu/hr)	505	505

			Single CT				Total CT	
	CT EF	DB EF	Current PTE		Post-Mod PTE		Current	Post-Mod
Pollutant	(lb/mmBtu)	(lb/mmscf)	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
1,3-Butadiene	0.00000043		0.001	0.003	0.001	0.003	0.01	0.01
Acetaldehyde	0.00004		0.07	0.29	0.07	0.32	0.59	0.64
Acrolein	0.0000064		0.01	0.05	0.01	0.05	0.09	0.10
Arsenic		0.0002	0.0001	0.0004	0.0001	0.0004	0.00	0.00
Benzene	0.000012	0.0021	0.02	0.09	0.02	0.10	0.18	0.20
Beryllium		0.000012	0.00001	0.00003	0.00001	0.00003	0.00	0.00
Cadmium		0.0011	0.0005	0.0024	0.001	0.002	0.00	0.00
Chromium		0.0007	0.0003	0.0015	0.0003	0.0015	0.00	0.00
Cobalt		0.000084	0.00004	0.00018	0.00004	0.00018	0.00	0.00
Ethylbenzene	0.000032		0.05	0.23	0.06	0.26	0.47	0.51
Formaldehyde	0.0001065	0.01125	0.18	0.80	0.20	0.87	1.61	1.75
Hexane		1.8	0.89	3.90	0.89	3.90	7.81	7.81
Manganese		0.00038	0.0002	0.0008	0.0002	0.0008	0.00	0.00
Mercury		0.00026	0.0001	0.0006	0.0001	0.0006	0.00	0.00
Naphthalene	0.0000013	0.00061	0.002	0.01	0.003	0.01	0.02	0.02
Nickel		0.0021	0.001	0.005	0.001	0.005	0.01	0.01
PAH	0.0000022	0.0000096	0.004	0.02	0.004	0.02	0.03	0.04
POM		0.0000882	0.00004	0.00019	0.00004	0.00019	0.00	0.00
Propylene Oxide	0.000029		0.05	0.21	0.05	0.23	0.42	0.46
Selenium		0.000024	0.00001	0.00005	0.00001	0.00005	0.00	0.00
Toluene	0.00013	0.0034	0.22	0.96	0.24	1.05	1.92	2.09
Xylenes	0.000064		0.11	0.47	0.12	0.51	0.94	1.02
TOTALS:			1.61	7.05	1.67	7.34	14.11	14.67

Notes:

1) Assumed GCV for natural gas: 1020 Btu/scf

2) Duct burner is unaffected by the modification.

3) EF Source: Appendix C of the Air Operating Permit Application, April 2009

4) Post-mod CT heat input based on GE data at standard conditions (59F, 100% load).

Appendix B – Toxic Air Pollutants Calculations

Table B-1: Toxic Air Pollutant Analysis - Inputs

Current Turbine/Duct Burner Configuration:		
Turbine heat input:	1671	mmBtu/hr
Duct burner heat input:	505	mmBtu/hr
Modified Turbine/Duct Burner Configuration:		
Turbine heat input:	1823	mmBtu/hr
Duct burner heat input:	505	mmBtu/hr
Assumed GCV of natural gas:	1020	Btu/scf

*All units authorized to operate 8,760 hr/yr.

Table B-2: Toxic Air Pollutant Analysis - Baseline Emissions

Pollutant	CAS	Emission Factor (lb/mmBtu)		Single Turbine Emission Rate (lb/hr)		
		Turbine	Duct Burner	Turbine	Duct Burner	Total
Acetaldehyde	75-07-0	4.00E-05		6.68E-02	0.00E+00	6.68E-02
Acrolein	107-02-8	6.40E-06		1.07E-02	0.00E+00	1.07E-02
Ammonia	7664-41-7					16.1
Arsenic & Compounds NOS	7440-38-2		1.96E-07	0.00E+00	9.90E-05	9.90E-05
Benz(a)anthracene	56-55-3		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Benzene	71-43-2	1.20E-05	2.06E-06	2.01E-02	1.04E-03	2.11E-02
Benzo(a)pyrene	50-32-8		1.18E-09	0.00E+00	5.94E-07	5.94E-07
Benzo(b)fluoranthene	205-99-2		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Benzo(k)fluoranthene	207-08-9		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Beryllium & Compounds NOS	N/A		1.18E-08	0.00E+00	5.94E-06	5.94E-06
1,3-Butadiene	106-99-0	4.30E-07		7.19E-04	0.00E+00	7.19E-04
Cadmium & Compounds NOS	7440-43-9		1.08E-06	0.00E+00	5.45E-04	5.45E-04
Chromium(VI) & Compounds NOS	7440-43-9		1.37E-06	0.00E+00	6.93E-04	6.93E-04
Chrysene	218-01-9		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Cobalt & Compounds NOS	7440-48-4		8.24E-08	0.00E+00	4.16E-05	4.16E-05
Copper & Compounds NOS	7440-50-8		8.33E-07	0.00E+00	4.21E-04	4.21E-04
Dibenzo(a,h)anthracene	53-70-3		1.18E-09	0.00E+00	5.94E-07	5.94E-07
7,12-Dimethylbenz(a)anthracene	57-97-6		1.57E-08	0.00E+00	7.92E-06	7.92E-06
Ethylbenzene	100-41-4	3.20E-05		5.35E-02	0.00E+00	5.35E-02
Formaldehyde	50-00-0	1.07E-04	1.10E-05	1.78E-01	5.57E-03	1.84E-01
Hexane	110-54-3		1.76E-03	0.00E+00	8.91E-01	8.91E-01
Indeno(1,2,3-cd)pyrene	193-39-5		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Lead & Compounds NOS	N/A		4.90E-07	0.00E+00	2.48E-04	2.48E-04
Manganese & Compounds NOS	7439-96-5		3.73E-07	0.00E+00	1.88E-04	1.88E-04
Mercury	7439-97-6		2.55E-07	0.00E+00	1.29E-04	1.29E-04
3-Methylcholanthrene	56-49-5		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Naphthalene	91-20-3	1.30E-06	5.98E-07	2.17E-03	3.02E-04	2.47E-03
Nickel & Compounds NOS	7440-02-0		2.06E-06	0.00E+00	1.04E-03	1.04E-03
Propylene Oxide	75-56-9	2.90E-05		4.85E-02	0.00E+00	4.85E-02
Selenium & Compounds NOS	7782-49-2		2.35E-08	0.00E+00	1.19E-05	1.19E-05
Toluene	108-88-3	1.30E-04	3.33E-06	2.17E-01	1.68E-03	2.19E-01
Vanadium	7440-62-2		2.25E-06	0.00E+00	1.14E-03	1.14E-03
Xylenes	1330-20-7	6.40E-05		1.07E-01	0.00E+00	1.07E-01

Emission Factor Sources
Turbines: Appendix C of the Air Operating Permit Application, April 2009
Turbines (ammonia): Emission limit from PSD permit
Duct Burners (lead): AP-42 Section 1.4, Table 1.4-2
Duct Burners (organics): AP-42 Section 1.4, Table 1.4-3
Duct Burners (metals): AP-42 Section 1.4, Table 1.4-4
Duct Burners (formaldehyde): Appendix C of the Air Operating Permit Application, April 2009

Table B-3: Toxic Air Pollutant Analysis - Potential Emissions

Pollutant	CAS	Emission Factor (lb/mmBtu)		Single Turbine Emission Rate (lb/hr)		
		Turbine	Duct Burner	Turbine	Duct Burner	Total
Acetaldehyde	75-07-0	4.00E-05		7.29E-02	0.00E+00	7.29E-02
Acrolein	107-02-8	6.40E-06		1.17E-02	0.00E+00	1.17E-02
Ammonia	7664-41-7					16.1
Arsenic & Compounds NOS	7440-38-2		1.96E-07	0.00E+00	9.90E-05	9.90E-05
Benz(a)anthracene	56-55-3		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Benzene	71-43-2	1.20E-05	2.06E-06	2.19E-02	1.04E-03	2.29E-02
Benzo(a)pyrene	50-32-8		1.18E-09	0.00E+00	5.94E-07	5.94E-07
Benzo(b)fluoranthene	205-99-2		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Benzo(k)fluoranthene	207-08-9		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Beryllium & Compounds NOS	N/A		1.18E-08	0.00E+00	5.94E-06	5.94E-06
1,3-Butadiene	106-99-0	4.30E-07		7.84E-04	0.00E+00	7.84E-04
Cadmium & Compounds NOS	7440-43-9		1.08E-06	0.00E+00	5.45E-04	5.45E-04
Chromium(VI) & Compounds NOS	7440-43-9		1.37E-06	0.00E+00	6.93E-04	6.93E-04
Chrysene	218-01-9		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Cobalt & Compounds NOS	7440-48-4		8.24E-08	0.00E+00	4.16E-05	4.16E-05
Copper & Compounds NOS	7440-50-8		8.33E-07	0.00E+00	4.21E-04	4.21E-04
Dibenzo(a,h)anthracene	53-70-3		1.18E-09	0.00E+00	5.94E-07	5.94E-07
7,12-Dimethylbenz(a)anthracene	57-97-6		1.57E-08	0.00E+00	7.92E-06	7.92E-06
Ethylbenzene	100-41-4	3.20E-05		5.83E-02	0.00E+00	5.83E-02
Formaldehyde	50-00-0	1.07E-04	1.10E-05	1.94E-01	5.57E-03	2.00E-01
Hexane	110-54-3		1.76E-03	0.00E+00	8.91E-01	8.91E-01
Indeno(1,2,3-cd)pyrene	193-39-5		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Lead & Compounds NOS	N/A		4.90E-07	0.00E+00	2.48E-04	2.48E-04
Manganese & Compounds NOS	7439-96-5		3.73E-07	0.00E+00	1.88E-04	1.88E-04
Mercury	7439-97-6		2.55E-07	0.00E+00	1.29E-04	1.29E-04
3-Methylcholanthrene	56-49-5		1.76E-09	0.00E+00	8.91E-07	8.91E-07
Naphthalene	91-20-3	1.30E-06	5.98E-07	2.37E-03	3.02E-04	2.67E-03
Nickel & Compounds NOS	7440-02-0		2.06E-06	0.00E+00	1.04E-03	1.04E-03
Propylene Oxide	75-56-9	2.90E-05		5.29E-02	0.00E+00	5.29E-02
Selenium & Compounds NOS	7782-49-2		2.35E-08	0.00E+00	1.19E-05	1.19E-05
Toluene	108-88-3	1.30E-04	3.33E-06	2.37E-01	1.68E-03	2.39E-01
Vanadium	7440-62-2		2.25E-06	0.00E+00	1.14E-03	1.14E-03
Xylenes	1330-20-7	6.40E-05		1.17E-01	0.00E+00	1.17E-01

Emission Factor Sources
Turbines: Appendix C of the Air Operating Permit Application, April 2009
Turbines (ammonia): Emission limit from PSD permit
Duct Burners (lead): AP-42 Section 1.4, Table 1.4-2
Duct Burners (organics): AP-42 Section 1.4, Table 1.4-3
Duct Burners (metals): AP-42 Section 1.4, Table 1.4-4
Duct Burners (formaldehyde): Appendix C of the Air Operating Permit Application, April 2009

Table B-4: Toxic Air Pollutant Analysis - De minimis Emissions Analysis

Pollutant	CAS	De minimis Standard		Emission Increase (CT1 + CT2)		Exempt From 173-460 Analysis?
		Threshold	Unit	lb/hr	lb/standard unit	
Acetaldehyde	75-07-0	3.00E+00	lb/year	1.22E-02	1.07E+02	NO
Acrolein	107-02-8	1.30E-03	lb/24-hr	1.95E-03	4.67E-02	NO
Ammonia	7664-41-7	1.90E+00	lb/24-hr	0.00E+00	0.00E+00	YES
Arsenic & Compounds NOS	7440-38-2	2.50E-03	lb/year	0.00E+00	0.00E+00	YES
Benz(a)anthracene	56-55-3	4.50E-02	lb/year	0.00E+00	0.00E+00	YES
Benzene	71-43-2	1.00E+00	lb/year	3.65E-03	3.20E+01	NO
Benzo(a)pyrene	50-32-8	8.20E-03	lb/year	0.00E+00	0.00E+00	YES
Benzo(b)fluoranthene	205-99-2	4.50E-02	lb/year	0.00E+00	0.00E+00	YES
Benzo(k)fluoranthene	207-08-9	4.50E-02	lb/year	0.00E+00	0.00E+00	YES
Beryllium & Compounds NOS	N/A	3.40E-03	lb/year	0.00E+00	0.00E+00	YES
1,3-Butadiene	106-99-0	2.70E-01	lb/year	1.31E-04	1.15E+00	NO
Cadmium & Compounds NOS	7440-43-9	1.90E-03	lb/year	0.00E+00	0.00E+00	YES
Chromium(VI) & Compounds NOS	7440-43-9	3.30E-05	lb/year	0.00E+00	0.00E+00	YES
Chrysene	218-01-9	4.50E-01	lb/year	0.00E+00	0.00E+00	YES
Cobalt & Compounds NOS	7440-48-4	3.70E-04	lb/24-hr	0.00E+00	0.00E+00	YES
Copper & Compounds NOS	7440-50-8	9.30E-03	lb/1-hr	0.00E+00	0.00E+00	YES
Dibenzo(a,h)anthracene	53-70-3	4.10E-03	lb/year	0.00E+00	0.00E+00	YES
7,12-Dimethylbenz(a)anthracene	57-97-6	6.90E-05	lb/year	0.00E+00	0.00E+00	YES
Ethylbenzene	100-41-4	3.20E+00	lb/year	9.73E-03	8.52E+01	NO
Formaldehyde	50-00-0	1.40E+00	lb/year	3.24E-02	2.84E+02	NO
Hexane	110-54-3	2.60E+00	lb/24-hr	0.00E+00	0.00E+00	YES
Indeno(1,2,3-cd)pyrene	193-39-5	4.50E-02	lb/year	0.00E+00	0.00E+00	YES
Lead & Compounds NOS	N/A	1.00E+01	lb/year	0.00E+00	0.00E+00	YES
Manganese & Compounds NOS	7439-96-5	1.10E-03	lb/24-hr	0.00E+00	0.00E+00	YES
Mercury	7439-97-6	1.10E-04	lb/24-hr	0.00E+00	0.00E+00	YES
3-Methylcholanthrene	56-49-5	7.80E-04	lb/year	0.00E+00	0.00E+00	YES
Naphthalene	91-20-3	2.40E-01	lb/year	3.95E-04	3.46E+00	NO
Nickel & Compounds NOS	7440-02-0	3.10E-02	lb/year	0.00E+00	0.00E+00	YES
Propylene Oxide	75-56-9	2.20E+00	lb/year	8.82E-03	7.72E+01	NO
Selenium & Compounds NOS	7782-49-2	7.40E-02	lb/24-hr	0.00E+00	0.00E+00	YES
Toluene	108-88-3	1.90E+01	lb/24-hr	3.95E-02	9.00E-01	YES
Vanadium	7440-62-2	3.70E-04	lb/24-hr	0.00E+00	0.00E+00	YES
Xylenes	1330-20-7	8.20E-01	lb/24-hr	1.95E-02	4.67E-01	YES

Table B-5: Toxic Air Pollutant Analysis - SQER Analysis

Pollutant	CAS	SQER Standard		Emission Increase (CT1 + CT2)		Increase < SQER?
		Threshold	Unit	lb/hr	lb/threshold unit	
Acetaldehyde	75-07-0	6.00E+01	lb/year	1.22E-02	1.07E+02	NO
Acrolein	107-02-8	2.60E-02	lb/24-hr	1.95E-03	4.67E-02	NO
Benzene	71-43-2	2.10E+01	lb/year	3.65E-03	3.20E+01	NO
1,3-Butadiene	106-99-0	5.40E+00	lb/year	1.31E-04	1.15E+00	YES
Ethylbenzene	100-41-4	6.50E+01	lb/year	9.73E-03	8.52E+01	NO
Formaldehyde	50-00-0	2.70E+01	lb/year	3.24E-02	2.84E+02	NO
Naphthalene	91-20-3	4.80E+00	lb/year	3.95E-04	3.46E+00	YES
Propylene Oxide	75-56-9	4.40E+01	lb/year	8.82E-03	7.72E+01	NO

Table B-6: Toxic Air Pollutant Analysis - Tier 1 Screening Analysis

Pollutant	CAS	ASIL (ug/m3)		Emission Increase (CT1 + CT2)		Increase < ASIL?
		Threshold	Avg. Time	lb/hr	ug/m3	
Acetaldehyde	75-07-0	3.70E-01	year	1.22E-02	2.25E-04	YES
Acrolein	107-02-8	3.50E-01	24-hr	1.95E-03	2.16E-04	YES
Benzene	71-43-2	1.30E-01	year	3.65E-03	6.76E-05	YES
Ethylbenzene	100-41-4	4.00E-01	year	9.73E-03	1.80E-04	YES
Formaldehyde	50-00-0	1.70E-01	year	3.24E-02	6.00E-04	YES
Propylene Oxide	75-56-9	2.70E-01	year	8.82E-03	1.63E-04	YES

Modeled Concentration @ 1 lb/hr:		
	1.85E-01	1-hr
	0.1112	24-hr
	1.85E-02	annual

Appendix C – GE Turbine Data

Pre-upgrade: 7FA.03 DLN2.6

Configuration		Pre-Uprate 7FA.03, 100% Load						
Ambient Temperature	*deg F*	-8	14	36	59	75	81	104
Ambient Relative Humidity	*%*	52%	52%	52%	52%	52%	52%	52%
Performance								
GT Output	*kW*	191,199	185,450	177,941	168,542	159,349	155,461	138,045
GT Heat Rate, LHV	*Btu/kWh*	9,086	9,100	9,173	9,301	9,436	9,504	9,888
GT Heat Consumption, LHV	*Mbtu/h*	1,737	1,688	1,632	1,568	1,504	1,478	1,365
GT Heat Consumption, HHV	*Mbtu/h*	1,923	1,868	1,807	1,735	1,664	1,636	1,511
Rated Emissions								
NOx @ 15% O2	*ppmvd*	9.0	9.0	9.0	9.0	9.0	9.0	9.0
NOx	*lb/hr*	62.9	61.1	59.1	56.8	54.5	53.5	49.4
NOx	*lb/Mbtu (HHV)*	0.0327	0.0327	0.0327	0.0327	0.0327	0.0327	0.0327
CO	*ppmvd*	9.0	9.0	9.0	9.0	9.0	9.0	9.0
CO	*lb/hr*	32.8	31.7	30.5	29.0	27.9	27.4	25.1
CO	*lb/Mbtu (HHV)*	0.0170	0.0169	0.0169	0.0167	0.0167	0.0167	0.0166
UHC	*ppmvw*	7.0	7.0	7.0	7.0	7.0	7.0	7.0
UHC	*lb/hr*	15.7	15.2	14.7	14.1	13.6	13.4	12.5
UHC	*lb/Mbtu (HHV)*	0.0082	0.0081	0.0081	0.0081	0.0082	0.0082	0.0083
VOC	*ppmvw*	1.4	1.4	1.4	1.4	1.4	1.4	1.4
VOC	*lb/hr*	3.1	3.0	2.9	2.8	2.7	2.7	2.5
VOC	*lb/Mbtu (HHV)*	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0017
SO2	*ppmvw*	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SO2	*lb/hr*	1.0	1.0	0.9	0.9	0.9	0.9	0.8
SO2	*lb/Mbtu (HHV)*	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
SO3	*ppmvw*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO3	*lb/hr*	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SO3	*lb/Mbtu (HHV)*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sulfur Mist	*lb/hr*	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PM10 (Total)	*lb/hr*	8.2	8.2	8.2	8.2	8.2	8.2	8.2
PM10 (Total)	*lb/Mbtu (HHV)*	0.0043	0.0044	0.0045	0.0047	0.0049	0.0050	0.0054
PM10 (Filterable)	*lb/hr*	4.1	4.1	4.1	4.1	4.1	4.1	4.1
PM10 (Filterable)	*lb/Mbtu (HHV)*	0.0021	0.0022	0.0023	0.0024	0.0025	0.0025	0.0027
PM2.5 (Total)	*lb/hr*	8.2	8.2	8.2	8.2	8.2	8.2	8.2
PM2.5 (Total)	*lb/Mbtu (HHV)*	0.0043	0.0044	0.0045	0.0047	0.0049	0.0050	0.0054
PM2.5 (Filterable)	*lb/hr*	4.1	4.1	4.1	4.1	4.1	4.1	4.1
PM2.5 (Filterable)	*lb/Mbtu (HHV)*	0.0021	0.0022	0.0023	0.0024	0.0025	0.0025	0.0027
CO2	*klb/hr*	230.1	223.6	216.2	207.7	199.2	195.7	180.8
CO2	*klb/Mbtu (HHV)*	0.1197	0.1197	0.1197	0.1197	0.1197	0.1197	0.1197

Post-upgrade: 7F.04 AGP DLN2.6 Low dP Combustor

Configuration		Post-Uprate 7FA.04, 100% Load						
Ambient Temperature	*deg F*	-8	14	36	59	75	81	104
Ambient Relative Humidity	*%*	52%	52%	52%	52%	52%	52%	52%
Performance								
GT Output	*kW*	205,551	205,551	195,405	181,231	171,007	167,023	150,446
GT Heat Rate, LHV	*Btu/kWh*	8,805	8,836	8,929	9,086	9,223	9,282	9,575
GT Heat Consumption, LHV	*Mbtu/h*	1,810	1,816	1,745	1,647	1,577	1,550	1,441
GT Heat Consumption, HHV	*Mbtu/h*	2,004	2,011	1,931	1,823	1,746	1,716	1,595
Rated Emissions								
NOx @ 15% O2	*ppmvd*	9.0	9.0	9.0	9.0	9.0	9.0	9.0
NOx	*lb/hr*	65.6	65.8	63.2	59.7	57.1	56.2	52.2
NOx	*lb/Mbtu (HHV)*	0.0327	0.0327	0.0327	0.0327	0.0327	0.0327	0.0327
CO	*ppmvd*	9.0	9.0	9.0	9.0	9.0	9.0	9.0
CO	*lb/hr*	31.8	31.7	30.6	29.1	27.9	27.4	25.1
CO	*lb/Mbtu (HHV)*	0.0159	0.0158	0.0158	0.0160	0.0160	0.0160	0.0157
UHC	*ppmvw*	7.0	7.0	7.0	7.0	7.0	7.0	7.0
UHC	*lb/hr*	15.3	15.3	14.8	14.1	13.7	13.5	12.6
UHC	*lb/Mbtu (HHV)*	0.0076	0.0076	0.0076	0.0078	0.0078	0.0078	0.0079
VOC	*ppmvw*	1.4	1.4	1.4	1.4	1.4	1.4	1.4
VOC	*lb/hr*	3.1	3.1	3.0	2.8	2.7	2.7	2.5
VOC	*lb/Mbtu (HHV)*	0.0015	0.0015	0.0015	0.0016	0.0016	0.0016	0.0016
SO2	*ppmvw*	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SO2	*lb/hr*	1.0	1.0	1.0	0.9	0.9	0.9	0.8
SO2	*lb/Mbtu (HHV)*	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
SO3	*ppmvw*	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SO3	*lb/hr*	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SO3	*lb/Mbtu (HHV)*	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sulfur Mist	*lb/hr*	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PM10 (Total)	*lb/hr*	8.2	8.2	8.2	8.2	8.2	8.2	8.2
PM10 (Total)	*lb/Mbtu (HHV)*	0.0041	0.0041	0.0042	0.0045	0.0047	0.0048	0.0051
PM10 (Filterable)	*lb/hr*	4.1	4.1	4.1	4.1	4.1	4.1	4.1
PM10 (Filterable)	*lb/Mbtu (HHV)*	0.0020	0.0020	0.0021	0.0022	0.0023	0.0024	0.0026
PM2.5 (Total)	*lb/hr*	8.2	8.2	8.2	8.2	8.2	8.2	8.2
PM2.5 (Total)	*lb/Mbtu (HHV)*	0.0041	0.0041	0.0042	0.0045	0.0047	0.0048	0.0051
PM2.5 (Filterable)	*lb/hr*	4.1	4.1	4.1	4.1	4.1	4.1	4.1
PM2.5 (Filterable)	*lb/Mbtu (HHV)*	0.0020	0.0020	0.0021	0.0022	0.0023	0.0024	0.0026
CO2	*klb/hr*	239.7	240.5	231.0	218.0	208.8	205.3	190.7
CO2	*klb/Mbtu (HHV)*	0.1196	0.1196	0.1196	0.1196	0.1196	0.1196	0.1196

Appendix D – Toxic Air Pollutant Modeling Output

```
AERSCREEN 16216 / AERMOD 19191                                        05/08/20
                                                                      15:24:41

TITLE: GRAYS HARBOR AIR TOXICS SCREEN


--------------------------------------------------------------------------------
****************************  STACK PARAMETERS  ****************************
--------------------------------------------------------------------------------

SOURCE EMISSION RATE:            0.1260 g/s                1.000 lb/hr
STACK HEIGHT:                     54.86 meters           180.00 feet
STACK INNER DIAMETER:             5.486 meters           216.00 inches
PLUME EXIT TEMPERATURE:           366.5 K                 200.0 Deg F
PLUME EXIT VELOCITY:             20.100 m/s                65.94 ft/s
STACK AIR FLOW RATE:           1006854 ACFM
RURAL OR URBAN:                   RURAL

FLAGPOLE RECEPTOR HEIGHT:          1.50 meters              4.92 feet

INITIAL PROBE DISTANCE =         10000. meters            32808. feet



--------------------------------------------------------------------------------
***********************  BUILDING DOWNWASH PARAMETERS  ***********************
--------------------------------------------------------------------------------

         NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS


**************************  PROBE ANALYSIS  **************************
                 25 meter receptor spacing: 200. meters - 5000. meters
                 50 meter receptor spacing: 5050. meters - 10000. meters


     Zo       ROUGHNESS       1-HR CONC   DIST      TEMPORAL
     SECTOR     LENGTH         (ug/m3)     (m)       PERIOD
     ------------------------------------------------------------------
      1*         1.300        0.1853       425.0      WIN
* = worst case flow sector



--------------------------------------------------------------------------------
**********************  MAKEMET METEOROLOGY PARAMETERS  **********************
--------------------------------------------------------------------------------

MIN/MAX TEMPERATURE:    273.1 / 298.7 (K)

MINIMUM WIND SPEED:       2.2 m/s

ANEMOMETER HEIGHT:     10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Coniferous Forest
DOMINANT CLIMATE TYPE:    Wet Conditions
DOMINANT SEASON:          Winter

ALBEDO:                  0.35
BOWEN RATIO:             0.30
```

```
ROUGHNESS LENGTH:       1.300 (meters)

SURFACE FRICTION VELOCITY (U*) NOT ADUSTED


       METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT
       ------------------------------------------------------------

 YR MO DY JDY HR
 -- -- -- --- --
 10 02 11  11 01

    H0     U*     W*  DT/DZ ZICNV ZIMCH  M-O LEN    Z0  BOWEN ALBEDO  REF WS
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
-10.36  1.960 -9.000  0.020 -999. 4000.   8888.0 1.300   0.30   0.35   10.00

    HT  REF TA     HT
- - - - - - - - - - -
  10.0   298.7    2.0

WIND SPEED AT STACK HEIGHT (non-downwash):       18.5 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:        50.3 meters
ESTIMATED FINAL PLUME RISE (non-downwash):       13.3 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):     63.7 meters


       METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT
       -------------------------------------------------------------

 YR MO DY JDY HR
 -- -- -- --- --
 10 02 17  11 01

    H0     U*     W*  DT/DZ ZICNV ZIMCH  M-O LEN    Z0  BOWEN ALBEDO  REF WS
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
-18.65  3.529 -9.000  0.020 -999. 4000.   8888.0 1.300   0.30   0.35   18.00

    HT  REF TA     HT
- - - - - - - - - - -
  10.0   298.7    2.0

WIND SPEED AT STACK HEIGHT (non-downwash):       33.3 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:        45.0 meters
ESTIMATED FINAL PLUME RISE (non-downwash):        4.2 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):     49.2 meters



--------------------------------------------------------------------------------
********************** AERSCREEN AUTOMATED DISTANCES **********************
                   OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE
--------------------------------------------------------------------------------


                    MAXIMUM                          MAXIMUM
           DIST     1-HR CONC               DIST     1-HR CONC
            (m)      (ug/m3)                 (m)      (ug/m3)
         ---------------------            ---------------------
          199.95    0.7467E-01            3850.00    0.2996E-01
          200.00    0.7476E-01            3875.00    0.2975E-01
          225.00    0.1221                3900.00    0.2954E-01
          250.00    0.1653                3925.00    0.2934E-01
          275.00    0.1804                3950.00    0.2913E-01
```

300.00	0.1829	3975.00	0.2893E-01
325.00	0.1805	4000.00	0.2873E-01
350.00	0.1750	4025.00	0.2853E-01
375.00	0.1805	4050.00	0.2833E-01
400.00	0.1845	4075.00	0.2813E-01
425.00	0.1853	4100.00	0.2794E-01
450.00	0.1838	4125.00	0.2775E-01
475.00	0.1805	4150.00	0.2756E-01
500.00	0.1761	4175.00	0.2737E-01
525.00	0.1708	4200.00	0.2718E-01
550.00	0.1650	4225.00	0.2700E-01
575.00	0.1589	4250.00	0.2681E-01
600.00	0.1527	4275.00	0.2663E-01
625.00	0.1486	4300.00	0.2645E-01
650.00	0.1469	4325.00	0.2627E-01
675.00	0.1446	4350.00	0.2609E-01
700.00	0.1420	4375.00	0.2592E-01
725.00	0.1390	4400.00	0.2575E-01
750.00	0.1357	4425.00	0.2557E-01
775.00	0.1323	4450.00	0.2540E-01
800.00	0.1291	4475.00	0.2523E-01
825.00	0.1258	4500.00	0.2507E-01
850.00	0.1225	4525.00	0.2490E-01
875.00	0.1192	4550.00	0.2474E-01
900.00	0.1159	4575.00	0.2457E-01
925.00	0.1126	4600.00	0.2441E-01
950.00	0.1094	4625.00	0.2425E-01
975.00	0.1063	4650.00	0.2409E-01
1000.00	0.1049	4675.00	0.2394E-01
1025.00	0.1036	4700.00	0.2378E-01
1050.00	0.1021	4725.00	0.2363E-01
1075.00	0.1006	4750.00	0.2348E-01
1100.00	0.9900E-01	4775.00	0.2332E-01
1125.00	0.9736E-01	4800.00	0.2317E-01
1150.00	0.9567E-01	4825.00	0.2303E-01
1175.00	0.9396E-01	4850.00	0.2288E-01
1200.00	0.9223E-01	4875.00	0.2273E-01
1225.00	0.9050E-01	4900.00	0.2259E-01
1250.00	0.8886E-01	4925.00	0.2245E-01
1275.00	0.8754E-01	4950.00	0.2231E-01
1300.00	0.8621E-01	4975.00	0.2216E-01
1325.00	0.8486E-01	5000.00	0.2203E-01
1350.00	0.8352E-01	5050.00	0.2175E-01
1375.00	0.8225E-01	5100.00	0.2148E-01
1400.00	0.8098E-01	5150.00	0.2122E-01
1425.00	0.7971E-01	5200.00	0.2096E-01
1450.00	0.7845E-01	5250.00	0.2070E-01
1475.00	0.7719E-01	5300.00	0.2045E-01
1500.00	0.7594E-01	5350.00	0.2021E-01
1525.00	0.7470E-01	5400.00	0.1997E-01
1550.00	0.7348E-01	5450.00	0.1973E-01
1575.00	0.7227E-01	5500.00	0.1950E-01
1600.00	0.7107E-01	5550.00	0.1927E-01
1625.00	0.6990E-01	5600.00	0.1904E-01
1650.00	0.6874E-01	5650.00	0.1882E-01
1675.00	0.6759E-01	5700.00	0.1860E-01
1700.00	0.6647E-01	5750.00	0.1839E-01
1725.00	0.6537E-01	5800.00	0.1818E-01
1750.00	0.6428E-01	5850.00	0.1797E-01
1775.00	0.6322E-01	5900.00	0.1777E-01
1800.00	0.6217E-01	5950.00	0.1757E-01
1825.00	0.6114E-01	6000.00	0.1738E-01
1850.00	0.6014E-01	6050.00	0.1718E-01

1875.00	0.5915E-01	6100.00	0.1700E-01
1900.00	0.5818E-01	6150.00	0.1684E-01
1925.00	0.5724E-01	6200.00	0.1673E-01
1950.00	0.5631E-01	6250.00	0.1661E-01
1975.00	0.5540E-01	6300.00	0.1650E-01
2000.00	0.5451E-01	6350.00	0.1639E-01
2025.00	0.5363E-01	6400.00	0.1628E-01
2050.00	0.5278E-01	6450.00	0.1617E-01
2075.00	0.5194E-01	6500.00	0.1606E-01
2100.00	0.5144E-01	6550.00	0.1595E-01
2125.00	0.5101E-01	6600.00	0.1584E-01
2150.00	0.5057E-01	6650.00	0.1574E-01
2175.00	0.5014E-01	6700.00	0.1563E-01
2200.00	0.4970E-01	6750.00	0.1552E-01
2225.00	0.4926E-01	6800.00	0.1542E-01
2250.00	0.4882E-01	6850.00	0.1531E-01
2275.00	0.4839E-01	6900.00	0.1521E-01
2300.00	0.4795E-01	6950.00	0.1510E-01
2325.00	0.4751E-01	7000.00	0.1500E-01
2350.00	0.4708E-01	7050.00	0.1490E-01
2375.00	0.4664E-01	7100.00	0.1480E-01
2400.00	0.4621E-01	7150.00	0.1470E-01
2425.00	0.4581E-01	7200.00	0.1460E-01
2450.00	0.4542E-01	7250.00	0.1450E-01
2475.00	0.4503E-01	7300.00	0.1440E-01
2500.00	0.4464E-01	7350.00	0.1430E-01
2525.00	0.4425E-01	7400.00	0.1428E-01
2550.00	0.4387E-01	7450.00	0.1435E-01
2575.00	0.4348E-01	7500.00	0.1442E-01
2600.00	0.4310E-01	7550.00	0.1448E-01
2625.00	0.4272E-01	7600.00	0.1455E-01
2650.00	0.4234E-01	7650.00	0.1461E-01
2675.00	0.4197E-01	7700.00	0.1468E-01
2700.00	0.4160E-01	7750.00	0.1474E-01
2725.00	0.4123E-01	7800.00	0.1479E-01
2750.00	0.4094E-01	7850.00	0.1485E-01
2775.00	0.4066E-01	7900.00	0.1491E-01
2800.00	0.4039E-01	7950.00	0.1496E-01
2825.00	0.4011E-01	8000.00	0.1501E-01
2850.00	0.3984E-01	8050.00	0.1506E-01
2875.00	0.3957E-01	8100.00	0.1511E-01
2900.00	0.3929E-01	8150.00	0.1515E-01
2925.00	0.3902E-01	8200.00	0.1520E-01
2950.00	0.3875E-01	8250.00	0.1524E-01
2975.00	0.3848E-01	8300.00	0.1527E-01
3000.00	0.3821E-01	8350.00	0.1531E-01
3025.00	0.3794E-01	8400.00	0.1534E-01
3050.00	0.3767E-01	8450.00	0.1536E-01
3075.00	0.3741E-01	8500.00	0.1536E-01
3100.00	0.3714E-01	8550.00	0.1536E-01
3125.00	0.3688E-01	8600.00	0.1535E-01
3150.00	0.3661E-01	8650.00	0.1535E-01
3175.00	0.3635E-01	8700.00	0.1534E-01
3200.00	0.3609E-01	8750.00	0.1534E-01
3225.00	0.3584E-01	8800.00	0.1533E-01
3250.00	0.3558E-01	8850.00	0.1532E-01
3275.00	0.3533E-01	8900.00	0.1532E-01
3300.00	0.3507E-01	8950.00	0.1531E-01
3325.00	0.3482E-01	9000.00	0.1530E-01
3350.00	0.3457E-01	9050.00	0.1529E-01
3375.00	0.3432E-01	9100.00	0.1528E-01
3400.00	0.3407E-01	9150.00	0.1527E-01
3425.00	0.3383E-01	9200.00	0.1525E-01

3450.00	0.3358E-01	9250.00	0.1524E-01
3475.00	0.3334E-01	9300.00	0.1523E-01
3500.00	0.3310E-01	9350.00	0.1522E-01
3525.00	0.3287E-01	9400.00	0.1520E-01
3550.00	0.3263E-01	9450.00	0.1519E-01
3575.00	0.3240E-01	9500.00	0.1517E-01
3600.00	0.3217E-01	9550.00	0.1516E-01
3625.00	0.3194E-01	9600.00	0.1514E-01
3650.00	0.3171E-01	9650.00	0.1512E-01
3675.00	0.3149E-01	9700.00	0.1511E-01
3700.00	0.3126E-01	9750.00	0.1509E-01
3725.00	0.3104E-01	9800.00	0.1507E-01
3750.00	0.3082E-01	9850.00	0.1505E-01
3775.00	0.3060E-01	9900.00	0.1503E-01
3800.00	0.3039E-01	9950.00	0.1501E-01
3825.00	0.3017E-01	10000.00	0.1499E-01

********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
FLAT TERRAIN	0.1854	0.1854	0.1668	0.1112	0.1854E-01

DISTANCE FROM SOURCE 420.00 meters

IMPACT AT THE AMBIENT BOUNDARY	0.7467E-01	0.7467E-01	0.6720E-01	0.4480E-01	0.7467E-02

DISTANCE FROM SOURCE 199.95 meters

Appendix E – Turbine tBACT

ACTIVE SMAQMD BACT CLEARINGHOUSE

CATEGORY: **TURBINE**

BACT Size: Minor Source BACT **GAS TURBINE**

BACT Determination Number: 203	**BACT Determination Date:** 10/30/2018

Equipment Information

Permit Number: 25800
Equipment Description: GAS TURBINE
Unit Size/Rating/Capacity: Turbine, 2200 mmBTU/hr
Equipment Location: SMUD FINANCING AUTHORITY (COSUMNES POWER PLANT)
14295 CLAY EAST RD
HERALD, CA

BACT Determination Information

ROCs	**Standard:**	1.0 ppmvd @t 15% O2, 3-Hr Avg, Oxidation Catalyst
	Technology Description:	Oxidation Catalyst
	Basis:	Achieved in Practice
NOx	**Standard:**	2.0 ppmvd @ 15% O2, 1-Hr Avg
	Technology Description:	SCR or Equivalent
	Basis:	Achieved in Practice
SOx	**Standard:**	Natural Gas or Equiv. that meets 0.7 gr S/100scf
	Technology Description:	
	Basis:	Achieved in Practice
PM10	**Standard:**	Natural Gas or Equiv. that meets 0.7 gr S/100scf
	Technology Description:	
	Basis:	Achieved in Practice
PM2.5	**Standard:**	Natural Gas or Equiv. that meets 0.7 gr S/100scf
	Technology Description:	
	Basis:	Achieved in Practice
CO	**Standard:**	2.0 ppmvd @t 15% O2, 1-HR avg, Oxidation Catalyst
	Technology Description:	Oxidation Catalyst
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments:

District Contact: Brian Krebs Phone No.: (916) 874 -4856 email: bkrebs@airquality.org

777 12th Street, Third Floor

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NO.:	203
DATE:	August 2, 2018
ENGINEER:	Brian Krebs

Category/General Equip Description:	Combustion Gas Turbine
Equipment Specific Description:	F-Class Combined Gas Turbine Nominal rating of 198.1 MW
Equipment Size/Rating:	Major Source BACT
Previous BACT Det. No.:	N/A

This Best Available Control Technology (BACT) determination category was determined under the project for A/C 25800 and 25801 (SMUD Cosumnes Power Plant (CPP). CPP is a combined cycle power plant that consists of two combined cycle combustion turbines, two unfired heat recovery steam generators, and one steam turbine. The combustion turbines utilize selective catalytic reduction for NOx control and an oxidation catalyst for CO and to a lesser extent VOC control.

BACT/T-BACT ANALYSIS

A: ACHIEVED IN PRACTICE (Rule 202, §205.1a)

The following technologies have either been currently employed as BACT/T-BACT for combustion gas turbines or are regulated by applicable District rules by the following agencies and air pollution control districts.

US EPA

BACT

Source: EPA RACT/BACT/LAER Clearinghouse

Gas turbine >25 MW	
Pollutant	**Standard**
VOC	0.3 ppmvd corrected to 15% O2 3hr average (Chouteau Power Plant, OK-0129)
NOx	2.0 ppmvd corrected to 15% O2 1hr average (OTAY Mesa Energy Center, CA-1177)

SOx	0.75 gr S/100 scf Fuel (St. Joseph Energy Center, LLC, IN-0158)
PM10	0.0025 lb/MMBTU (Filer City Station, MI-0427)
PM2.5	NA
CO	0.9 ppmvd corrected to 15% O2 1hr average (CPV Towantic, CT-0157 & CT-0158, and Killingly Energy Center, CT-1061) 1.5 ppmvd corrected to 15% O2 1 Hr average (Avenal Energy Project, CA-1192, Palmdale Hybrid Power Project, CA-1212, and Warren County Power Plant – Dominion, VA-0315) 2.0 ppmvd corrected to 15% O2 1 Hr Average (Sand Hill Energy Center, TX-0709

T-BACT
There are no T-BACT standards published in the clearinghouse for this category

RULE REQUIREMENTS

40 CFR Part 60 subpart KKKK – Standards of Performance for Stationary Combustion Turbines

New, modified, or reconstructed turbine firing natural gas, > 850 MMBTU/hr	
Pollutant	**Standard**
NOx	15 ppmvd corrected to 15% O2
SOx	1. 0.90 lb SO2/MW-hr or 2. 0.060 lb SO2/MMBtu heat input of the fuel

CALIFORNIA AIR RESOURCES BOARD

BACT
Source: ARB BACT Clearinghouse

Gas turbine >=50 MW	
Pollutant	**Standard**
VOC	0.7 ppmvd corrected to 15% O2 3hr average (La Paloma Generating Co. LLC)
NOx (A)	1.5 ppmvd corrected to 15% O2 1hr average (IDC Bellingham LLC) 2.0 ppmvd corrected to 15% O2 1hr average (Cosumnes Power Plant)
Sox	1 ppmvd corrected to 15% O2 Calendar Day average (Sutter Power Plant)
PM10	0.0056 lb/MMBTU (Cosumnes Power Plant)
PM2.5	0.0056 lb/MMBTU (Cosumnes Power Plant)
CO	2.0 ppmvd corrected to 15% O2 1hr average (Magnolia Power)

(A) Conversation from the permitting authority of the IDC Bellingham LLC indicated that the facility was never built.

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS
None.

CAPCOA

BACT
Source: CAPCOA BACT Clearinghouse

Gas turbine >=23MMBTU/hr	
Pollutant	**Standard**
VOC	0.6 ppmvd corrected to 15% O2 (A330-862-98 Bear Mountain Limited)
NOx	2.0 ppmvd corrected to 15% O2 3hr average (A330-877-99 Federal Cold Storage)
SOx	PUC natural gas assuming 0.7 gr/100 scf (A330-882-99 Sutter Power Plant)
PM10	PUC natural gas assuming 0.7 gr/100 scf (A330-882-99 Sutter Power Plant)
PM2.5	PUC natural gas assuming 0.7 gr/100 scf (A330-882-99 Sutter Power Plant)
CO	4.0 ppmvd corrected to 15% O2 Calendar Day average (A330-882-99 Sutter Power Plant)

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS
None.

SMAQMD

BACT
Source: SMAQMD BACT Clearinghouse

Gas turbine, 170 MW, 1865 MMBTU/hr – CPP, PO16006	
Pollutant	**Standard**
VOC	1.4 ppmvd corrected to 15% O2 3 hr average
NOx	2.0 ppmvd corrected to 15% O2 1hr average
SOx	1 gr s/100scf
PM10	9.0 lb/hr
PM2.5	NA
CO	4.0 ppmvd corrected to 15% O2 3 hr average

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS

Rule 413 – Stationary Gas Turbines (03-24-05)

Pollutant	Standard
NOx (gaseous fuel)	9 ppmvd corrected to 15% O2 excluding startups/shutdowns and short-term excursions
NOx (liquid fuel)	25 ppmvd corrected to 15% O2 excluding startups/shutdowns and short-term excursions

Startup/Shutdown
(Cold Start) - 4 hrs if steam turbine is shutdown for 72 hrs or more
(Warm Start) - 3 hrs if steam turbine is shutdown for between 8 hrs and 72 hrs or more
(Hot Start) - 1 hrs if associated steam turbine is shutdown for less than or equal to 8 hrs

SCAQMD

BACT

Source: Section I - SCAQMD LAER/BACT Determinations
Section II – Other LAER/BACT Determinations
Section III – Other Technologies
PART D: BACT Guidelines For Non-Major Polluting Facilities

Gas Turbine – For each specific pollutant, listed is the most stringent standard along with ID.	
Pollutant	**Standard**
VOC	1.4 ppmvd corrected to 15% O2 1 hr average (Mountain View, 366147)
NOx	2.0 ppmvd corrected to 15% O2 1hr average (Vernon City, 394164)
SOx	0.004 gr/scf (Three Mountain, 99-PO-01)
PM10	0.0012 gr/scf (Three Mountain, 99-PO-01)
PM2.5	NA
CO	2.0 ppmvd corrected to 15% O2 1 hr average (Magnolia, 386305)

T-BACT

There are no T-BACT standards published in the clearinghouse for this category

RULE REQUIREMENTS

Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines (08-08-97)

Pollutant	Standard
NOx (gaseous fuel)	9 ppmvd corrected to 15% O2 excluding thermal stabilization period

Thermal Stabilization Period
2 hrs or as specified in the permit issued prior to 8/4/89.

SAN DIEGO COUNTY APCD

BACT

Source: NSR Requirements for BACT

There are no BACT standards published in the clearinghouse for this category

T-BACT

There are no T-BACT standards published in the clearinghouse for this category

RULE REQUIREMENTS

Rule 69.3 – Stationary Gas Turbine Engines – Reasonably Available Control Technology (12-16-98)

Pollutant	Standard
NOx (gaseous fuel)	42 ppmvd corrected to 15% O2 excluding startups
NOx (liquid fuel)	65 ppmvd corrected to 15% O2 excluding startups

Startup
Startup - a maximum of 2 hrs unless an extended startup is authorized

Rule 69.3.1 – Stationary Gas Turbine Engines – Best Available Retrofit Technology (02-24-10)

Pollutant	Standard
NOx (gaseous fuel)	9 ppmvd X E/25 corrected to 15% O2 excluding startups
NOx (liquid fuel)	25 ppmvd X E/25 corrected to 15% O2 excluding startups

E=(MRTE)(LHV)/(HHV)

Where:

E: **"Unit Thermal Efficiency (E)"** means the percent thermal efficiency of the gas turbine engine

MRTE: **"Manufacturer's Rated Thermal Efficiency (MRTE)"** means the manufacturer's continuous rated percent thermal efficiency of the gas turbine engine, including the effect of any air pollution control equipment if such equipment is installed, at peak load, after correction to lower heating value.

LHV: **"Lower Heating Value (LHV)"** means the total heat liberated, excluding the heat of condensation of water, per mass of fuel burned (Btu per pound) when fuel and dry air at standard conditions undergo complete combustion and all resultant products are brought to standard conditions.

HHV: **"Higher Heating Value (HHV)"** means the total heat liberated, including the heat of condensation of water, per mass of fuel burned (Btu per pound) when fuel and dry air at standard conditions undergo complete combustion and all resultant products are brought to standard conditions.

Startup
Normal Startup - a maximum of 2 hrs unless an extended startup is authorized
Extended Startup - a maximum of 6 hrs for a combined cycle unit when the APCO determines that key parameters indicates that 2 hrs is not sufficient to meet the emission limits.

BAAQMD

BACT

Source: NSR Requirements for BACT

Combined Cycle >=40 megawatts	
Pollutant	**Standard**
VOC	2.0 ppmvd corrected to 15% O2
NOx	2.0 ppmvd corrected to 15% O2
SOx	Natural Gas Fuel 1 gr/100 scf
PM10	Natural Gas Fuel 1 gr/100 scf
PM2.5	No standard
CO	4.0 ppmvd corrected to 15% O2

T-BACT

There are no T-BACT standards published in the clearinghouse for this category

RULE REQUIREMENTS

Regulation 9, Rule 9 Nitrogen Oxides from Stationary Gas Turbines (12-06-06)

>500 MMBTU/HR	
Pollutant	**Standard**
NOx (gaseous fuel)	5 ppmvd corrected to 15% O2 excluding startups/shutdowns
NOx (Refinery, waste or LPG gas)	9 ppmvd corrected to 15% O2 excluding startups/shutdowns
NOx (liquid fuel)	25 ppmvd corrected to 15% O2 excluding startups/shutdowns

Startup/Shutdown
Normal Startup - a maximum of 4 hrs
Cold Steam Turbine Starts at combined cycle facilities - a maximum of 6 hrs
Shutdown - a maximum of 2 hrs

San Joaquin Valley APCD

BACT

Source: BACT Clearinghouse

BACT #3.4.2

Gas Turbine - >= 50 MW, Uniform Load, with Heat Recovery	
Pollutant	**Standard**
VOC	1.5 ppmvd corrected to 15% O2 (Technologically Feasible) 2.0 ppmvd corrected to 15% O2 (Achieved in Practice)
NOx	2.0 ppmvd corrected to 15% O2, 1 hr average, excluding startup and shutdown (Technologically Feasible) 2.5 ppmvd corrected to 15% O2, 1 hr average, excluding startup and shutdown (Achieved in Practice)
SOx	PUC-regulated natural gas of 0.75 g S/100 scf
PM10	Air inlet filter cooler, lube oil vent coalescer and natural gas fuel or equal
PM2.5	No standard
CO	4.0 ppmvd corrected to 15% O2 (Technologically Feasible) 6.0 ppmvd corrected to 15% O2 (Achieved in Practice)

T-BACT

There are no T-BACT standards published in the clearinghouse for this category

RULE REQUIREMENTS

Rule 4703 – Stationary Gas Turbines (9-20-07)

>10 MW, Combined Cycle	
Pollutant	**Standard**
NOx (gaseous fuel)	3 ppmvd corrected to 15% O2 excluding startups (Enhanced Option)
NOx (liquid fuel)	25 ppmvd corrected to 15% O2 excluding startups
CO	25 ppmvd corrected to 15% O2 excluding startups (GE Frame 7)

Startup
Normal Startup - a maximum of 2 hrs unless an extended startup is authorized
Extended Startup - as approved by the APCO, ARB, and EPA

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
Pollutant	**Standard**
VOC	1. EPA - 0.3 ppmvd corrected to 15% O2, 3 Hr average (Chouteau Power Plant – OK-0129) 2. CAPCOA – 0.6 ppmvd corrected to 15% O2, 3 Hr average (Bear Mountain Limited – A330-862-98) 3. EPA – 0.7 ppmvd corrected to 15% O2, 1 Hr average and Average of 3-1 Hr stack tests – (CT-0161, NJ-0082, NY-0104) 4. CARB – 0.7 ppmvd corrected to 15% O2, (LaPaloma Generating Co, LLC) 5. EPA – 1.0 ppmvd corrected to 15% O2, 3-Hr Block average (MA-0039 and MD-0041) 6. SMAQMD – 1.4 ppmvd corrected to 15% O2, 3 Hr average (CPP, PO 16006) 7. SCAQMD – 1.4 ppmvd corrected to 15% O2, 1 Hr average (Mountain View, 366147) 8. SJVAPCD – 2.0 ppmvd corrected to 15% O2, 1 Hr average 9. BAAQMD – 2.0 ppmvd corrected to 15% O2 10. SDCAPCD – no determination
NOx	1. CARB – 1.5 ppmvd corrected to 15% O2, 1 Hr average (IDC Bellingham LLC) 2. EPA – 2.0 ppmvs corrected to 15% O2, 1 Hr average (Avenal Energy Project, CA – 1192 and many others) 3. CARB – 2.0 ppmvd corrected to 15% O2, 1 Hr average (CPP and others) 4. SMAQMD - 2.0 ppmvd corrected to 15% O2, 1 Hr average (CPP, PO 16006) 5. SCAQMD - 2.0 ppmvd corrected to 15% O2, 1 Hr average (Vernon City, 394164) 6. CAPCOA - 2.0 ppmvd corrected to 15% O2, 3 Hr average (Federal Cold Storage, A330-877-99) 7. BAAQMD - 2.0 ppmvd corrected to 15% O2 8. SJVAPCD - 2.5 ppmvd corrected to 15% O2, 1 Hr average 9. SDCAPCD - 9 ppmvd corrected to 15% O2, (Rule 69.3.1)
SOx	1. SCAQMD - 0.4 gr S/100 scf Fuel 2. CARB – 0.7 gr S/100 scf Fuel 3. CAPCOA – 0.7 gr S/100 scf Fuel 4. EPA - 0.75 gr S/100 scf Fuel 5. SJVAPCD – 0.75 gr S/100 scf Fuel 6. SMAQMD – 1 gr S/100 scf Fuel 7. BAAQMD – 1 gr S/100 scf Fuel 8. SDCAPCD – no determination
PM10	1. EPA – 0.0025 lb/MMBTU 2. SMAQMD - 0.0048 lb/MMBTU 3. SCAQMD – 0.0056 lb/MMBTU 4. CARB – 0.0056 lb/MMBTU 5. SJVAPCD – Air inlet filter cooler, lube oil vent coalescer and natural gas fuel

	or equal. 6. CAPCOA – The combusting of PUC Natural Gas with a 0.7 gr S/100 scf 7. BAAQMD - Natural Gas Fuel with 1 gr S/100 scf 8. SDCAPCD – no determination
PM2.5 (A)	1. EPA – 0.0025 lb/MMBTU 2. SMAQMD - 0.0048 lb/MMBTU 3. SCAQMD – 0.0056 lb/MMBTU 4. CARB – 0.0056 lb/MMBTU 5. SJVAPCD – Air inlet filter cooler, lube oil vent coalescer and natural gas fuel or equal. 6. CAPCOA – The combusting of PUC Natural Gas with a 0.7 gr S/100 scf 7. BAAQMD - Natural Gas Fuel with 1 gr S/100 scf 8. SDCAPCD – no determination
CO	1. EPA – 0.9 ppmvd corrected to 15% O2, 1 Hr block (CPV Towantic, LLC, CT-0157 & CT-0158, and Killingly Energy Center, CT-0161) 2. EPA - 1.5 ppmvd corrected to 15% O2, 1 Hr average (Avenal Energy Project, CA-1192) 3. EPA – 2.0 ppmvd corrected to 15% O2, 1 Hr average (Sand Hill Energy Center, TX-0709) 4. CARB – 2.0 ppmvd corrected to 15% O2, 1 Hr average (Magnolia Power) 5. SCAQMD - 2.0 ppmvd corrected to 15% O2, 1 Hr average (Magnolia Power) 6. CAPCOA – 4.0 ppmvd corrected to 15% O2, Calendar Day average (Sutter Power Plant, A330-882-99) 7. SMAQMD – 4.0 ppmvd corrected to 15% O2, 3 Hr average (CPP, PO16006) 8. BAAQMD - 4.0 ppmvd corrected to 15% O2 9. SJVAQMD – 6.0 ppmvd corrected to 15% O2 10. SDCAPCD – no determination
T-BACT (VOC)	N/A – [SMAQMD, SCAQMD, SDCAPCD, BAAQMD, SJVAPCD, ARB, EPA, CAPCOA]

(A) Assume same as PM10

Discussion:

General

The various determinations above span many years. They represent various sizes, classes and manufacturer of the individual turbines. Each power plant in which these turbines are employed can be configured differently to meet the individual needs of the utility and in many cases these factors as well as the previous ones mentioned make it difficult to compare. Many times the emission rates that ultimately are reported as BACT are not a result of a specific technology or control, but rather represents the applicants willingness to accept a smaller compliance margin in order to lessen the permitting burden (availability and cost of emission offsets, CEQA, Major source or PSD thresholds, etc..). For a few pollutants, NOx, VOC and CO, good combustion design and practices can be combined with actual control technology such as Selective Catalytic Reduction or an Oxidation Catalyst to result in lower emissions of these respective pollutants. For particulate, emissions rates are influenced primarily by the fuel quality, combustion design

and emission monitoring precision. For SOx, the emission rates are almost exclusively related to the sulfur content of the fuel which for all of the turbines listed above were from combusting various qualities of natural gas.

VOC

The most stringent VOC concentration reported for all of the projects analyzed was 0.3 ppmvd corrected to 15% O2, 3 hour average from the Chouteau Power Plant in Oklahoma. The turbine is a Siemens V84.3A rated at approximately 1882 MMBTU/hr. Though it appears to be similar in size, it is a different manufacturer and assuredly a different configuration. The CO emissions are listed at 8 ppm which is substantially higher than many of the others evaluated. This project is the only project of the top performing projects that does not utilize an oxidation catalyst which might explain the rather poor CO emission concentration. For these reasons, this BACT determination will not be considered achieved in practice for this application.

The next most stringent VOC emission concentration is 0.6 ppmvd corrected to 15% O2, 3 hour average at the Bear Mountain Limited power plant. This determination is for a GE LM5000 which is an aero-derivative turbine which is much smaller and not at all comparable to a frame turbine. As such, this BACT determination will not be considered achieved in practice for this application.

Several projects reported BACT determinations of 0.7 ppmvd corrected to 15% O2 for various averaging periods. None of these projects reported using the same manufacturer and class of turbine and as such, these BACT determinations will not be considered achieved in practice for this application.

Finally, the next most stringent standard was 1.0 ppmvd corrected to 15% O2 for various averaging periods. There were many projects that arrived at this BACT determination and a few of them reported this determination for General Electric 7FA turbines which are the same as the subject of this BACT determination. All of them utilized an oxidation catalyst. For this reason, a VOC BACT determination that requires an oxidation catalyst that results in a VOC concentration of 1.0 ppmvd corrected to 15% O2, 3-hour average will be considered achieved in practice.

NOx

The most stringent NOx concentration reported for all of the projects analyzed was 1.5 ppmvd corrected to 15% O2, 1 hour average from the IDC Bellingham LLC power plant project in Massachusetts. Conversations with the permitting authority indicated that the project was never built. As such, this BACT determination will not be considered achieved in practice for this application.

The next most stringent NOx emission concentration is 2.0 ppmvd corrected to 15% O2, 1 hour average. This was for many projects throughout the nation including the project for which is the subject of this BACT determination (CPP). All of the projects at this level utilize Selective Catalytic Reduction to achieve this level of NOx control. Though the projects analyzed all use SCR, SCONOx or perhaps other control technologies could potentially achieve similar results. For this reason, no specific control technology will be specified, but rather a NOx BACT determination that results in a NOx concentration of 2.0 ppmvd corrected to 15% O2, 1 hour average will be considered achieved in practice for this application.

SOx

As mentioned previously, SOx emissions are directly related to the sulfur content of the fuel and all of the projects analyzed combust natural gas with sulfur contents that are contained in their local fuel supply. From all of the projects analyzed, the most stringent sulfur content specified was 0.4 gr S/100 scf of fuel. However, this was for a project in Redding CA, Three Mountain, 99-PO-01a which was not built[1]. As such, this BACT determination will not be considered achieved in practice. The next most stringent sulfur content specified was 0.7 gr S/100 scf of fuel. The natural gas fuel supply for the CPP project meets this requirement. Therefore, a SOx BACT determination of natural gas fuel that meet 0.7 gr S/100 scf will be considered achieved in practice.

Particulate (PM10/PM2.5)

Again as mentioned previously, none of the projects utilize any type of add on control for particulate. Though all of the projects employ good combustion practices, some projects report lower particulate emission rates than others with similar equipment and fuel. This is just a function of the projects willingness to accept a lower compliance margin rather than any attempt at lower emissions. Therefore a specific emission rate will not be considered as achieved in practice.

All of the remaining determinations specify the combustion of a clean fuel (i.e. "natural gas"). In addition to the use of combusting natural gas or equivalent, the SJVAPCD identified two combustion practices that can be utilized to minimize particulate emissions. For these reasons, a Particulate (PM10/PM2.5) BACT determination of an air inlet filter cooler, lube oil vent coalescer, and the combusting of natural gas or equivalent will be considered achieved in practice.

CO

Two projects reported BACT determinations of 0.9 ppmvd corrected to 15% O2 without duct firing and 1.7 ppmvd corrected to 15% O2 with duct firing (CPV Towantic, LLC and Killingly Energy Center). Both projects are not operational yet and the turbines appear to be much larger. For these reasons, these BACT determinations will not be considered achieved in practice for this application.

The next most stringent CO emission concentration is 1.5 ppmvd corrected to 15% O2, 1 hour average for the Avenal Energy Project, Palmdale Hybrid Power Project, and the Warren County Power Plant – Dominion. All of the projects utilize an oxidation catalyst to achieve this level of CO control. The Avenal Energy Center and Palmdale Hybrid Power Project are not currently constructed[1]. The Warren County Power Plant is a much larger turbine and has a higher emission limit when the unit is duct firing. For these reasons, this emission concentration is not considered achieved in practice for this application.

Lastly, a CO concentration of 2.0 ppmvd corrected to 15% O2, 1 hour average was found for several turbine projects. The Sand Hill Energy Center is a similar sized turbine, utilizes an oxidation catalyst, and does not have a less stringent limit while duct firing. For these reasons, a CO BACT determination that requires an oxidation catalyst that results in a CO concentration of 2.0 ppmvd corrected to 15% O2 will be considered achieved in practice.

[1] The California Energy Commission maintains a project status webpage for the California power plants under their jurisdiction https://www.energy.ca.gov/sitingcases/all_projects.html.

START-UP's
Since the start-up provisions of the South Coast Rule 1134 only apply to turbines in existence prior to August of 1989 when the physical size of the units did not require extended start-up times, this start-up provision was not considered. A review of the rest of the start-up provisions of the District's rules determined that the start-up provisions of the current CPP turbine continue to be the most stringent.

BEST CONTROL TECHNOLOGIES - ACHIEVED IN PRACTICE	
Pollutant	**Standard**
VOC	1.0 ppmvd corrected to 15% O2, 3-Hr average, utilizing an Oxidation Catalyst
NOx	2.0 ppmvd corrected to 15% O2, 1-Hr average
Sox	Natural Gas or equivalent that meets 0.7 gr Sulfur/100 scf
PM10	Natural gas or equivalent fuel that meets 0.7 gr Sulfur/100 scf with an air inlet filter cooler and lube oil vent coalescer.
PM2.5 (A)	Natural gas or equivalent fuel that meets 0.7 gr Sulfur/100 scf with an air inlet filter cooler and lube oil vent coalescer.
CO	2.0 ppmvd corrected to 15% O2, 1-Hr average utilizing an Oxidation Catalyst

(A) Assume same as PM10

B: TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.)

Technologically Feasible Alternatives:
Any alternative basic equipment, fuel, process, emission control device or technique, singly or in combination, determined to be technologically feasible by the Air Pollution Control Officer.

The table below shows the technologically feasible alternatives identified as capable of reducing emissions beyond the levels determined to be "Achieved in Practice" as per Rule 202, §205.1.a.

Pollutant	Technologically Feasible Alternative
VOC	No other technologically feasible option identified (A)
NOx	No other technologically feasible option identified
SOx	No other technologically feasible option identified
PM10	No other technologically feasible option identified
PM2.5	No other technologically feasible option identified

CO	No other technologically feasible option identified (A)

(A) The SJVAPCD identified technologically feasible emission standards for both VOC and CO. However in both cases, the standards selected for Achieved in Practice were found to be more stringent.

Cost Effective Determination:
Since no other technologies were determined to be technologically feasible, a cost analysis is not applicable.

CONCLUSION

Therefore, no identified technologically feasible controls are considered.

C: SELECTION OF BACT

BACT (#203) COMBUSTION GAS TURBINE	
Pollutant	**Standard**
VOC	1.0 ppmvd corrected to 15% O2, 3-Hr average, utilizing an Oxidation Catalyst
NOx	2.0 ppmvd corrected to 15% O2, 1-Hr average
SOx	Natural Gas or equivalent that meets 0.7 gr Sulfur/100 scf
PM10	Natural gas or equivalent fuel that meets 0.7 gr Sulfur/100 scf with an air inlet filter cooler and lube oil vent coalescer.
PM2.5	Natural gas or equivalent fuel that meets 0.7 gr Sulfur/100 scf with an air inlet filter cooler and lube oil vent coalescer.
CO	2.0 ppmvd corrected to 15% O2, 1-Hr average utilizing an Oxidation Catalyst

D: SELECTION OF T-BACT

No T-BACT determinations were identified. However since the majority of the risk is expected to be from VOC's, the VOC BACT determination will be considered to be T-BACT

REVIEWED BY: _____ **DATE:** _____

APPROVED BY: _____ **DATE:** _____

Appendix F – Site Certification Agreement Amendment Package

GRAYS HARBOR ENERGY LLC

Invenergy

August 17, 2020

Kathleen Drew, Chair
Energy Facility Site Evaluation Council
621 Woodland Square Loop SE
P.O. Box 43172
Olympia, WA 98504-3172

Subject: Grays Harbor Energy Center
Request to Amend the Site Certification Agreement

Dear Chair Drew:

Pursuant to WAC 463-66-030, we are writing on behalf of Grays Harbor Energy LLC (GHE) to request an amendment of the Site Certification Agreement (SCA) for the Grays Harbor Energy Center to accommodate the installation of General Electric's Advanced Gas Path package in Units 1 and 2. The Advanced Gas Path is a GE equipment and software improvement to the combustion turbines, which would increase their efficiency and output. As described in the SCA, the Grays Harbor Energy Center currently consists of two combustion turbine generators, each nominally rated at 175 megawatts (MW) and a steam turbine generator rated at 300 MW, for a total plant rated capacity of 650 MW. The Advanced Gas Path package will modestly increase the maximum output of each combustion turbine generator. Output varies based on ambient conditions, but according to GE engineering data, after the Advanced Gas Path package is installed, the output of each turbine will increase to 181.2 MW at 59 degrees F and 100% load.

The proposed modification will help EFSEC fulfill its statutory mandate of providing abundant energy at a reasonable cost. It will enable the facility to continue to provide clean, flexible natural gas-fired generating capacity to meet increasing electrical demand in the region and to facilitate the integration of intermittent renewable generation resources. The equipment and software replacements will improve the efficiency and output of the facility, without any new facility construction or footprint expansion.

In addition to authorizing installation of the Advanced Gath Path package, GHE also requests that the Council amend the SCA to extend to 2028 the deadline for commencing construction of Units 3 and 4, which the Council and the Governor authorized by SCA Amendment 5.

The remainder of this letter describes the requested amendment in more detail and explains how it satisfies the Council's regulatory requirements. In addition to this letter, we are providing a SEPA Checklist, a redlined SCA showing the specific amendment language requested, and a PSD permit minor modification application.

Questions regarding GHE's Amendment Request should be directed to the following:

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I. Introduction

The Grays Harbor Energy Center is located on a 22-acre site within the 1,600-acre Satsop Development Park. EFSEC and the Satsop site have a long history. In 1976, the initial SCA authorized construction of Nuclear Projects No. 3 and No. 5, which were never completed. In 1996, the SCA was amended to authorize construction of a natural gas-fired combined cycle generating facility, and in 1999, the terms relating to the nuclear projects were removed.

In the decade that followed, EFSEC amended the SCA several times to reflect changes in the project ownership, from Energy Northwest to Duke Energy and then to GHE, and to reflect changes in the equipment proposed for Units 1 and 2. Units 1 and 2 were eventually constructed and put into operation in April 2008.

In 2011, the SCA was amended to authorize an expansion of the facility. This SCA amendment authorized a doubling of the facility's output, with the construction of two additional combustion turbine units, heat recovery steam generators and a steam turbine generator. The SCA refers to this expansion as Units 3 and 4. Construction on Units 3 and 4 has not yet begun.

II. Advanced Gas Path Package

GHE asks EFSEC to amend the existing SCA to authorize the installation of the GE Advanced Gas Path package in Units 1 and 2. The Advanced Gas Path package makes both hardware and software changes to the combustion turbines. The existing hot gas path components are replaced with more robust parts, made from advanced materials and coatings that are able to withstand higher firing temperatures. The existing combustor will also be replaced with a low D/P DLN 2.6 combustor, which features newly designed liners and flow sleeves that reduce the pressure drop and improve combustion efficiency. Together with an upgraded model-based controls architecture, these hardware changes allow the turbines to be fired at higher temperatures, which improves their overall efficiency and increases their maximum potential output.

The result is an improvement in heat rate, with engineering data provided by GE showing a 2.3% percent increase in efficiency. This means more electricity can be produced from the same amount of natural gas combusted, and accordingly, a lower emission rate for CO_2 and other regulated pollutants per megawatt-hour of electricity produced.

The Advanced Gas Path package will also increase the generation capacity of each combustion turbine to 181.2 MW at 59 degrees F and 100% load.

The Northwest Power Pool is starting to experience tightening reserve margins due to the projected retirement of more than 4,400 MW of coal-fired and hydroelectric power generation in the next seven years.[1] During the same period in which this generation will be retired, demand in the region is expected to grow at a rate of 0.5% annually.[2] The modest increase in capacity resulting from installing the Advanced Gas Path package will help to address the need for additional baseload capacity with efficient, reliable and clean gas-fired generation. Generation in the region is dispatched according to efficiency. Because the Grays Harbor Energy Center is dispatched before less efficient gas-fired generation, its emissions per megawatt-hour of electricity generated are less than those of other less efficient generating facilities. This means that any potential increase in the total volume of emissions from the Grays Harbor Energy Center that results from increasing its maximum capacity are more than offset by reductions in emissions from the less efficient facilities that would have operated otherwise.

The Grays Harbor Energy Center provides flexible capacity because it is possible to ramp up and ramp down output relatively quickly. This flexibility is particularly important in the region, as the amount of intermittent renewable (wind and solar) generation capacity grows. The increase in baseload capacity created by the Advanced Gas Path package will provide additional flexibility, which will make it easier to integrate more wind and solar resources in the region.

1

Plant Name	Summer Capacity (MW)	Type	Approx. Distance to Grays Harbor (mi)	Retirement Year
Centralia 1	670	Coal	30	2020
Centralia 2	670	Coal	30	2025
Colstrip (1-2)	614	Coal	800	2019
Colstrip (3-4)	1480	Coal	800	2027
Boardman	585	Coal	200	2020
North Valmy 1	254	Coal	520	2019
Copco	62	Hydro	350	2021
John C Boyle	98	Hydro	340	2020
Iron Gate	19	Hydro	350	2020
TOTAL	4,452			

Source: SNL, PA Consulting, NERC

[2] Source: SNL, PA Consulting, NERC

A. Regulatory Analysis

EFSEC regulations, at WAC 463-66-040 provide that "[i]n reviewing any proposed amendment, the council shall consider whether the proposal is consistent with:

(1) The intention of the original SCA;
(2) Applicable laws and rules;
(3) The public health, safety, and welfare; and
(4) The provisions of chapter 463-72 WAC."

The requested amendment satisfies these requirements:

First, the amendment is consistent with the intention of the SCA. As explained above, EFSEC has amended the SCA several times. The intention of the SCA has always been to authorize electrical generation facilities at the Satsop site, first the nuclear facility, then a natural gas-fired 2x1 combined-cycle combustion turbine facility, and then a second 2x1 combined-cycle combustion turbine addition to the facility.[3] EFSEC approved the amendments authorizing the gas-fired combined-cycle combustion turbine facilities, and Governors Lowry and Gregoire executed the SCA amendments. The purpose of those SCA amendments was to allow large-scale electrical generation using state-of-the art natural gas-fired combined-cycle combustion turbine technology. The requested amendment is consistent with this intention to use efficient advanced gas-fired technology to generate electricity for the region.

Second, the amendment is consistent with applicable laws and rules. The proposed equipment modification will comply with the existing SCA terms and conditions, except where noted on the enclosed red-line of the SCA. It will also comply with air and water permit requirements.

Third, the amendment is consistent with the public health, safety and welfare. The amendment would authorize GHE to replace existing equipment and software. It will not require greenfield construction or increase the facility footprint. It will make the most out of the existing facility. The facility will continue to operate within the emission limits established by the existing PSD permit. Although the maximum potential greenhouse gas emissions could be greater, the increase in facility efficiency means a lower emissions rate per megawatt hour of electricity produced. Water use and discharge, and operating noise levels will remain within the limits established by the SCA and NPDES permit. These and other potential effects of the amendment are addressed in greater detail in the SEPA Checklist and summarized briefly below.

Fourth, the amendment is consistent with the provisions of chapter 463-72 WAC. This chapter of the WAC contains EFSEC's regulations governing site restoration. The Council has already approved an Initial Site Restoration plan for the Grays Harbor Energy Center. The requested amendment does not propose any change to that approved plan or to the SCA's site restoration conditions.

The Council should approve the requested amendment because the four regulatory criteria are met.

[3] The 2x1 combined cycle configuration has two gas turbine generators, heat recovery steam generators and one steam turbine generator.

B. EFSEC Process

EFSEC's regulations authorize the Council to approve certain types of SCA amendments by resolution without need for the Governor's approval. WAC 463-66-070 provides:

> An amendment request which does not substantially alter the substance of any provisions of the SCA, or which is determined not to have a significant detrimental effect upon the environment, shall be effective upon approval by the council. Such approval may be in the form of a council resolution.

The requested amendment clearly falls within this category of amendments that the Council may approve by resolution. The replacement of existing equipment and software, with its resulting modest output increase and efficiency improvement does not substantially alter the substance of the SCA, and it will not have a significant detrimental effect on the environment.

C. Environmental Analysis

The installation of the Advanced Gas Path package will avoid material adverse environmental impacts because it does not require any additional construction at the facility and will comply with the current air emission limits in the PSD and Title V Operating permits, as well as the many other terms and conditions found in the SCA and the NPDES permit. As demonstrated in more detail in the SEPA Checklist, a mitigated determination of significance for the requested amendment is appropriate under SEPA. The following summarizes some of the environmental issues addressed in the SEPA Checklist.

1. Air Quality

The Advanced Gas Path package installation will not create any new sources of emissions and will not require the construction of any new structures at the facility. Installation will consist of the replacement of parts inside the existing combustion turbine units and a change in the system software.

Although the PSD permit will have to be revised to reflect the equipment change, GHE is not requesting any change in the permit limits. The turbines will be able to continue to meet all hourly and annual emission limits. Although at full load, the combustion turbines may have greater emissions with the Advanced Gas Path package, the existing emission control technology (notably the selective catalytic reduction and oxidation catalyst control systems) will be able to maintain emissions within the permit limits.

2. Greenhouse Gases

The Advanced Gas Path package will allow a higher heat input for the combustion turbines. When operated at full load, this would result in a modest increase in CO_2 mass emissions compared to current operation of the turbines at full load. Although the maximum potential CO_2 emissions would be slightly higher after the Advanced Gas Path package is installed, the increase in efficiency will mean a lower CO_2 emission rate per megawatt hour of electricity generated. More detailed information is provided in the SEPA Checklist.

As explained above, market dispatch ensures that the most efficient gas-fired generation operates at any given time to meet power demand needs. Accordingly, when the Grays Harbor Energy Center operates at 100% load and takes advantage of the modest increase in output from the Advanced Gas Path package, it is operating instead of a less efficient facility. Consequently, the increase in CO_2 emissions from the Grays Harbor Energy Center is offset by emissions avoided at less efficient facilities that would otherwise operate to meet power demand needs.

As the Council is aware, the facility already has an approved Greenhouse Gas Mitigation Plan. In addition, Washington law has several provisions that address greenhouse gases, including the Greenhouse Gas Performance Standard established pursuant to RCW chapter 80.80, the Greenhouse Gas mitigation requirements established pursuant to RCW chapter 80.70, and the Clean Air Rule promulgated by the Department of Ecology. As explained in more detail in the SEPA Checklist, the increase in maximum facility output and the potential increase of greenhouse gas emissions resulting from installation of the Advanced Gas Path package is not sufficient to trigger CO_2 mitigation requirements under RCW chapter 80.70 and WAC chapter 463-80. To the extent that mitigation is appropriate under state law, it will be addressed by the Department of Ecology's implementation of the Clean Air Rule.

3. Noise

The Grays Harbor Energy Center is subject to the statewide noise limits established by Ecology regulation and incorporated in the SCA by reference. See SCA Article V.E.2. The facility has complied with these noise limits and will continue to do so. The combustion turbines themselves are not a major source of noise from the facility, and the equipment replaced during the Advanced Gas Path package installation is all inside the turbine housing. Accordingly, no increase in noise is expected. In fact, another Invenergy-affiliate has installed the Advanced Gas Path package at its Nelson Energy Center in Rock Falls, Illinois and has not experienced any noticeable noise change or noise complaints.

4. Water Use and Discharge

The Grays Harbor Energy Center's primary water use is associated with the cooling tower. The SCA contains limits on the amount of water that may be withdrawn from the nearby Ranney wells for use in the cooling tower, and the facility's NPDES permit establishes limits for various parameters in the wastewater discharge. GHE will continue to comply with these requirements and is not requesting any change to them. Depending upon the ambient conditions, the hotter firing of the combustion turbines could result in a slight increase in water used in the cooling tower, but the change is not expected to be material. No change in the quality of wastewater discharge is expected.

III. Units 3 & 4 Extension

SCA Article II.B.2. currently requires construction of Units 3 and 4 to begin by February 18, 2021:

> This Site Certification Agreement authorizes the Certificate Holders to begin construction of Units 3 and 4 within ten (10) years of the execution of Amendment No. 5. If construction of Units 3 and 4's major components has not been commenced within ten (10) years of the execution of Amendment No. 5, all rights under this Site Certification Agreement to construction and operation of Units 3 and 4 will cease.

> If the Certificate Holders do not begin construction of Units 3 and 4 within five (5) years of the execution of Amendment No. 5, the Certificate Holders will report to the Council their intention to continue and will certify that the representations in the application, environmental conditions, pertinent technology and regulatory conditions remain current and applicable, or identify any changes and propose appropriate revisions in the Site Certification Agreement to address changes. Construction may begin only upon prior Council authorization, upon the Council's finding that no changes to the Site Certification Agreement are necessary or appropriate, or upon the effective date of any necessary or appropriate changes to the Site Certification Agreement.
>
> Further, if the Certificate Holders do not begin construction of Units 3 and 4 within five (5) years of the execution of Amendment No. 5 and the Council has adopted by rule changes to the standards governing "construction and operation for energy facilities" specified in WAC chapter 463-62, the construction and operation of Units 3 and 4 will be governed by the regulations in effect at the time the Council authorizes construction to proceed.[4]

GHE requests that the SCA be amended to extend this deadline to February 18, 2028.

GHE is not currently in a position to begin construction of Units 3 and 4 by February 2021. Several important steps must occur before construction of the expansion can begin. GHE would be required to prepare the certifications and supporting materials identified in the quoted language above, and GHE would need to prepare and submit for approval the various plans required by the SCA. Market conditions do not yet support construction of Units 3 and 4.

Although market conditions do not currently support construction of Units 3 and 4, GHE believes that they may by 2028, given the planned baseload retirements described above. If the Council amended the SCA as requested, GHE would remain subject to the conditions requiring GHE to certify "that the representations in the application, environmental conditions, pertinent technology and regulatory conditions remain current and applicable," and to address any changes to EFSEC's regulatory standards governing the construction and operation of energy facilities. At the point that GHE indicates its intention to proceed and makes that certification, the Council would consider whether changes to the SCA were "necessary or appropriate" before authorizing construction to proceed.

The requested amendment satisfies the four requirements of WAC 463-66-040, which are outlined above. Extending the construction timeline is consistent with the SCA's intent, which was to allow for additional efficient and clean, natural gas-fired generating capacity to be constructed at the Satsop site, taking advantage of the existing developed site and associated infrastructure. The amendment would also be consistent with applicable laws and rules, the public health, safety and welfare, and the provisions of 463-72 WAC, all of which were fully considered by the Council when it recommended Amendment 5 and are addressed in the SCA. The Council will also have an opportunity to consider these issues when GHE makes the certifications required in Article II.B.2 quoted above.

From a public policy standpoint, the Unit 3 and 4 expansion remains the best opportunity to add significant natural gas-fired generation if and when it is needed in Washington. The expansion would provide

[4] This SCA provision is similar to the Council's regulations at WAC chapter 463-68. Under those regulations, EFSEC may extend to the term of an SCA. WAC 463-68-080(3).

reliable, efficient and clean power, would be governed by air and water permitting requirements, and would not result in any of environmental impacts that would result from constructing a generating facility and associated infrastructure at an undeveloped site.

EFSEC should adopt the requested amendment by resolution because it would not substantially alter the substance of the SCA or have a significant detrimental effect on the environment. See WAC 463-66-070.

IV. Conclusion

For the reasons discussed above, GHE requests that the Council recommend an amendment of the Site Certification Agreement, in accordance with WAC 463-66-030, to accommodate the installation and operation of the Advanced Gas Path package on Units 1 and 2, and to extend the deadline for commencing construction of Units 3 and 4. We look forward to a discussion with EFSEC regarding the process it will use to consider the requested amendment.

Please do not hesitate to contact me directly if you have any questions.

Sincerely,

DocuSigned by:
Chris Sherin
C55DD32EE76F445...

Chris Sherin
Plant Manager

Attachments:
SEPA Checklist
SCA Red-line
PSD Minor Modification Request

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background [HELP]

1. Name of proposed project, if applicable: Grays Harbor Energy Center - Advanced Gas Path Installation

2. Name of applicant: Grays Harbor Energy LLC

3. Address and phone number of applicant and contact person:
401 Keys Road, Elma, WA 98541
Chris Sherin (360) 482-4349

4. Date checklist prepared: August 17, 2020

5. Agency requesting checklist: EFSEC

6. Proposed timing or schedule (including phasing, if applicable): Grays Harbor Energy proposes to install the Advanced Gas Path package in 2021 during the spring outage period.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

EFSEC has extensive environmental information, including discharge and emission monitoring data, concerning the operation of the Grays Harbor Energy Center. Additional information concerning the proposed Advanced Gas Path installation is provided in this Checklist.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No.

10. List any government approvals or permits that will be needed for your proposal, if known.

The project requires an amendment to the Site Certification Agreement and revision to the PSD permit, although no changes are being proposed to the emission limits in the permit.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The requested amendment to the Site Certification Agreement would authorize installation of the GE Advanced Gas Path package to the combustion turbines of Units 1&2 at the Grays Harbor Energy Center, and would extend the date for starting construction of Units 3&4 to 2028.

The Advanced Gas Path package makes both hardware and software changes to the combustion turbines. The existing hot gas path components are replaced with more robust parts, made from advanced materials and coatings able to withstand higher firing temperatures. The existing combustor will also be replaced with a low D/P DLN2.6 combustor which features newly designed liners and flow sleeves that reduce the pressure drop and improve combustion

efficiency. Together with an upgraded model-based controls architecture, these changes allow the turbines to be fired at higher temperatures, which improves the overall efficiency and increases power production.

The hardware replacement and software upgrade will allow for more efficient combustion while lowering the heat rate of the turbines. This will increase the capacity of each combustion turbine to 181.2 MW, based on GE engineering data at 59 degrees F and 100% load.

The upgrade will also allow the turbines to operate longer periods between scheduled maintenance because the parts are more durable than the stock equipment.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The 22-acre site is located approximately 0.5 miles southwest of the Chehalis River near the town of Elma. The 1600-acre Satsop Development Park surrounds the site on all four sides. Fuller Creek is approximately 0.5 mile to the east, and Workman Creek is located approximately 2 miles to the east.

B. Environmental Elements [HELP]

1. *Earth* [help]

a. General description of the site: The site is already developed. Accordingly, most of the questions in this section are not relevant to determining the potential environmental effects of the proposed equipment and software replacement.

(circle one): (Flat), rolling, hilly, steep slopes, mountainous, other _____

b. What is the steepest slope on the site (approximate percent slope)?

Not applicable - the proposed project does not involve additional development at the site.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Not applicable - the site is already developed and the proposed project will not involve any disturbance of soil.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Not applicable - the site is already developed.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

The project does not involve any filling, excavation or grading.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No soil disturbance is required during the installation of this equipment.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Not applicable. No new structures or additional construction are required.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Not applicable. The project will not result in erosion or other impacts to earth.

2. Air [help]

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

The only emissions during construction would come from mobile equipment used to aid in the installation of the new turbine components. Cranes, trucks, mobile equipment, and power tools fueled by diesel and gasoline will be used to power this machinery. Installation will occur during the approximately six week outage period when other repairs and equipment replacement occurs in the ordinary course and this mobile equipment is already on site. Air emissions from this equipment will be minor.

The AGP package, once installed, will allow for more efficient combustion of natural gas in the turbines; however, the method of operation will not change. Emission rates of all pollutants on a lb/mmBtu basis are shown by General Electric to remain the same or decrease. Although an increase in gas combustion would result in a slight increase of NOx and CO exiting the turbines, those emissions will be controlled by the selective catalytic reduction (SCR) and the oxidation catalyst, respectively, so that they comply with the the BACT limits already set in the Operating Permit. GHEC is not requesting an increase to the established limits; therefore, the air quality modeling done previously remains applicable.

The Advanced Gas Path package will not change the rate of greenhouse gas (GHG) emissions on a lb/mmBtu basis. If more gas is combusted, the total volume of GHG emissions will increase accordingly. If operated at full load, the combustion turbines at the Grays Harbor Energy Center could emit up to 9.1% more GHGs than prior to its installation. However, improved efficiency means that the rate of GHG emissions per megawatt-hour of electricity generated will be approximately 5% lower at 59 degrees F and 100% load.

The potential mass increase in GHG emissions falls below the applicability threshold for regulation under the EPA Clean Power Plan as outlined in 40 CFR 60 Subpart TTTT. The increase also falls below the EFSEC threshold for GHG mitigation in WAC 463-80.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

No.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

No change. The turbine emissions will continue to be controlled by selective catalytic reduction, oxidation catalyst, and good combustion practices with no effect on current permit limits.

3. Water [help]

a. Surface Water: [help]

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Not applicable. The project will not affect any surface waters.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

No.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

None. The project does not involve fill or dredging.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No. The Advanced Gas Path package is not expected to result in an increase in water used by the facility. Grays Harbor Energy is not requesting any change in the SCA's water use conditions and will continue to comply with those conditions.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Not applicable - the project does not involve any new construction; it merely replaces equipment and software.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No. The Advanced Gas Path package is not expected to result in any changes to the wastewater discharged from the facility, which is governed by the facility's NPDES permit. Grays Harbor Energy has not requested any changes to the NPDES permit.

b. Ground Water: [help]

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

Not applicable. The project does not involve groundwater withdrawals.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Not applicable. The project does not involve waste discharge.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Not applicable. This project will not affect stormwater drainage. Stormwater at the facility is controlled through the methods outlined in the SWPPP.

2) Could waste materials enter ground or surface waters? If so, generally describe.

No.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

No.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any: No change.

4. Plants [help]

a. Check the types of vegetation found on the site: Not applicable. The site is a fully developed industrial site.

____deciduous tree: alder, maple, aspen, other
____evergreen tree: fir, cedar, pine, other
____shrubs
____grass
____pasture
____crop or grain
____ Orchards, vineyards or other permanent crops.
____ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other

____other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

No alteration of the site is required.

c. List threatened and endangered species known to be on or near the site.

Not applicable. The equipment and software replacement will not have any effect on wildlife, whether listed or not.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Not applicable. The project does not involve landscaping or vegetation.

e. List all noxious weeds and invasive species known to be on or near the site.

Not applicable. The site is already developed; the project will not involve any clearing, earthwork or impacts to vegetation.

5. Animals [help]

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Examples include:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other _____

Not applicable. The project involves equipment and software replacement inside an already constructed and operating facility. It will not affect animals.

b. List any threatened and endangered species known to be on or near the site.

Not applicable.

c. Is the site part of a migration route? If so, explain.

Not applicable.

d. Proposed measures to preserve or enhance wildlife, if any:

Not applicable.

e. List any invasive animal species known to be on or near the site.

Not applicable.

6. Energy and Natural Resources [help]

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

During equipment replacement, cranes, trucks, mobile equipment, and power tools will be fueled by minor amounts of diesel and gasoline . These cranes, trucks and other equipment will already be on-site and in-use for maintenance and repair work done during the spring outage.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

The project will improve the heat rate of the combustion turbines by approximately 2.3% when comparing GE engineering data at 59 degrees F and 100% load from before and after the modification.

7. Environmental Health [help]

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

The proposed equipment replacement will not create significant risks. The existing SPCC Plan describes the oil, fuel, and hazardous material storage facilities; reporting systems; prevention requirements; and spill response procedure. The Hazardous Waste Management Procedure establishes a program for the handling, storage, and disposal of wastes from the Grays Harbor Energy Center site. No changes will be required to any of these plans.

1) Describe any known or possible contamination at the site from present or past uses.

Not applicable. The site is already developed.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

Not applicable. Equipment replacement will be inside the existing combustion turbines.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Equipment replacement will not require the use of more than de minimis amounts of

toxic or hazardous chemicals.

4) Describe special emergency services that might be required.

Not applicable.

5) Proposed measures to reduce or control environmental health hazards, if any:

None required.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

None. No change.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Short-term effects during installation of the AGP will be minimal, and comparable to the noise associated with maintenance work that takes place during annual outage periods.

The Grays Harbor Energy Center is already required to comply with state regulatory limits for noise, and the facility will continue to comply with those limits. The proposed equipment replacement and software upgrade is not expected to change the noise produced by the facility.

3) Proposed measures to reduce or control noise impacts, if any:

None required.

8. Land and Shoreline Use [help]

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The Grays Harbor Energy Center currently operates at the site, and will continue to do so. The proposed equipment and software replacement will not affect nearby land uses.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

No. The site is developed.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides,

tilling, and harvesting? If so, how:

No

c. Describe any structures on the site.

The Grays Harbor Energy Center.

d. Will any structures be demolished? If so, what?

No.

e. What is the current zoning classification of the site?

Not applicable.

f. What is the current comprehensive plan designation of the site?

Not applicable.

g. If applicable, what is the current shoreline master program designation of the site?

Not applicable.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

Not applicable.

i. Approximately how many people would reside or work in the completed project?

Not applicable.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

None. The proposal will not change the land use or impact other land uses. It is merely an equipment replacement and software upgrade.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

None. There are no such impacts.

9. Housing [help]

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None.

c. Proposed measures to reduce or control housing impacts, if any:

None. There will be no impacts.

10. Aesthetics [help]

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Not applicable. There will be no change in the height of any structure.

b. What views in the immediate vicinity would be altered or obstructed?

None.

c. Proposed measures to reduce or control aesthetic impacts, if any:

None. There will be no impact.

11. Light and Glare [help]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

None.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No.

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

None. There will be no impacts.

12. Recreation [help]

a. What designated and informal recreational opportunities are in the immediate vicinity?

None that would be impacted by the project.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

None. There will be no impacts.

13. Historic and cultural preservation [help]

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers ? If so, specifically describe.

Not applicable. The site is already developed and the project will not involve any demolition, excavation or other such construction.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

None that would be affected by the project.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

None. The project will not involve any impact to cultural or historic resources.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

Not applicable.

14. Transportation [help]

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

The site is accessed from Keys Road. The facility is already in operation, and the proposed equipment and software replacement will not affect transportation in the area.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

Not applicable.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

None.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

No.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

None.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

No.

h. Proposed measures to reduce or control transportation impacts, if any:

The proposed equipment replacement will occur during the Spring 2021 outage period when other equipment maintance occurs. Trucks and cranes used for the proposed equipment replacement would already be transiting to and from the site for scheduled maintenance.

15. Public Services [help]

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

No.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. Utilities [help]

a. Circle utilities currently available at the site:
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____

The site already has necessary utilities; no change in service is contemplated by the project.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

None

C. Signature [HELP]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: DocuSigned by: Chris Sherin C55DD32EE76F445...

Name of signee Chris Sherin

Position and Agency/Organization Plant Manager, Grays Harbor Energy Center

Date Submitted: 8/17/20

SITE CERTIFICATION AGREEMENT

BETWEEN

THE STATE OF WASHINGTON,

GRAYS HARBOR ENERGY LLC

AND

GRAYS HARBOR ENERGY II LLC

GRAYS HARBOR ENERGY CENTER

LOCATED IN:
GRAYS HARBOR COUNTY, WASHINGTON

Incorporating all provisions up to and including
AMENDMENT NO. 5

EXECUTED OCTOBER 27, 1976
AMENDMENT NO. 1 MARCH 18, 1982
AMENDMENT NO. 2 MAY 21, 1996
AMENDMENT NO. 3 AUGUST 12, 1999
TECHNICAL AMENDMENT, RESOLUTION NO. 297, FEBRUARY 12, 2001
TECHNICAL AMENDMENT, RESOLUTION NO. 298, APRIL 13, 2001
TECHNICAL AMENDMENT, RESOLUTION NO. 309, APRIL 19, 2004
TECHNICAL AMENDMENT, RESOLUTION NO. 312, MARCH 24, 2005
AMENDMENT NO. 5, ORDER NO. 860, DECEMBER 21, 2010
TECHNICAL AMENDMENT, RESOLUTION NO. XXX, XXXXXX XX, 2020

TABLE OF CONTENTS

Site Certification Agreement

Between
The State Of Washington,
Grays Harbor Energy LLC
and
Grays Harbor Energy II LLC

for the
Grays Harbor Energy Center

Located In Grays Harbor County, Washington

PREAMBLE

This Site Certification Agreement is made and entered into pursuant to Chapter 80.50 of the Revised Code of Washington by and between the State of Washington (which is also referred to as the "State" in this document), acting by and through the Governor of the State of Washington, Grays Harbor Energy LLC, a Delaware limited liability company, and Grays Harbor Energy II LLC, a Delaware limited liability company, (referred to collectively as "Certificate Holders").

The initial Site Certification Agreement was executed on October 27, 1976, by Governor Daniel J. Evans and provided for construction and operation of Nuclear Projects No. 3 and No. 5. On March 18, 1982, Governor John Spellman approved Amendment No. 1, which included changes to the terms for the operation of emergency diesel generators for Projects No. 3 and No. 5. On May 21, 1996, Governor Mike Lowry approved an Amended Site Certification Agreement incorporating Amendment No. 2, which provided authorization and the terms and conditions for construction and operation of the combustion turbine project. On August 12, 1999, Governor Gary Locke approved Amendment No. 3 which removed the terms and conditions for Nuclear Projects No. 3 and No. 5 (WNP-3 and WNP-5), but retained the terms and conditions for the combustion turbine project.

On February 12, 2001, the Energy Facility Site Evaluation Council (referred to as the "Council" in this document) approved by resolution the addition of Duke Energy as a co-agreement holder with Energy Northwest. On April 13, 2001, the Council approved, by resolution, technical changes to the project description.

On November 19, 2001, Energy Northwest and Duke Energy submitted an application to amend this Site Certification Agreement, which would have been Amendment No. 4, but they later withdrew the amendment request.

On April 19, 2004, the Council approved, by resolution, technical changes to clarify provisions related to water use. On March 24, 2005, the Council approved a resolution removing Energy Northwest from the Site Certification Agreement and naming Grays Harbor Energy LLC, as the successor to Duke Energy Grays Harbor Energy, LLC, as the Certificate Holder.

On 2/15/11 , Governor Christine Gregoire approved Amendment No. 5, which authorized the construction and operation of two additional gas-fired turbines, an additional steam turbine generator and associated facilities at the Grays Harbor Energy Center (GHEC) and added Grays Harbor Energy II LLC as a co-Certificate Holder.

On _____, 2020, the Council approved by resolution, technical changes authorizing installation of General Electric's Advanced Gas Path package on Units 1 and 2 and extending the deadline for commencing construction of Units 3 and 4.

The Grays Harbor Energy Center consists of up to four gas-fired combustion turbine units and two steam turbine-generators, and associated facilities. The project is located on a 22-acre site within a prior construction laydown area on the former Satsop Nuclear Power Plant Site. The balance of the former nuclear site has been transferred to the Grays Harbor Public Development Authority ("PDA"), a political subdivision of Grays Harbor County, to pursue economic development activity pursuant to county ordinances and RCW 80.50.300. Grays Harbor Energy LLC owns the 22-acre Project site and has agreements with the PDA to ensure that all facilities and/or systems necessary to support the construction and operation of the project are available.

This Site Certification Agreement is administered on behalf of the State by the Energy Facility Site Evaluation Council, also referred to as "EFSEC" or the "Council" in this document.

The parties hereto now desire to set forth all terms, conditions, and covenants relating to such site certification in this Site Certification Agreement pursuant to the provisions of RCW 80.50.100(1).

ARTICLE I: DEFINITIONS

"Approval" (by EFSEC) means an affirmative action by EFSEC or its properly-authorized agents, regarding documents, plans, designs, programs, or other similar requirements submitted pursuant to this Agreement.

"Associated facilities" means storage, transmission, handling, or other related and supporting facilities connecting the facility with existing energy and fuel supply, processing, or distribution systems, including, but not limited to, the natural gas fuel line from the Grays Harbor Energy Center metering point to the turbines, utility connections, and the electrical power lines connecting the Grays Harbor Energy Center to existing Bonneville Power Administration electrical transmission lines. The project does not include a natural gas delivery system, other than those elements under the Certificate Holders' control and located on the generating facility site.

"Commencement of construction" means the initiation or beginning of any actual construction activities such as form work, rebar, or pouring concrete for a unit's major components (e.g., the combustion turbine), but excludes site preparation.

"EFSEC" or "Council" means the State of Washington Energy Facility Site Evaluation Council created by Chapter 80.50 RCW, or such other agency or agencies of the State of Washington as may hereafter succeed to the powers of EFSEC for the purpose of this Agreement.

"Certificate Holder" means Grays Harbor Energy LLC after March 24, 2005. After December 21, 2010, "Certificate Holder" means both Grays Harbor Energy LLC and Grays Harbor Energy II LLC, jointly and severally.

"Site Certificate Agreement" or "SCA" refers to this agreement.

"Site preparation" means grading, excavation, and preparation of lay down areas prior to commencement of construction.

"Units 1 and 2" means the energy generation facility, consisting of two combustion turbine generators, one steam generator, and associated facilities, the construction of which was completed in 2008.

"Units 3 and 4" means two additional combustion turbine generators, one steam generator and associated facilities authorized to be constructed and operated pursuant to Amendment No. 5 of this Agreement.

"Will" in this agreement when referencing an action to be taken by the Certificate Holder, means that the certificate holder is obligated to perform the action as set out in the relevant text.

ARTICLE II SITE CERTIFICATION

A. Site Description

The site for the Grays Harbor Energy Center is located in Grays Harbor County, Washington, south of the Chehalis River near the town of Satsop, and is more particularly described in Attachment I, which is incorporated herein by this reference.

B. Site Certification

1. The State authorizes the combined cycle combustion turbine generating project, known as the Grays Harbor Energy Center, and as described below, to be located, constructed, and operated in the locations described in Section I.A.1 and I.A.2.

   a. The project consists of up to four natural gas-fired turbine units, up to two steam turbine-generators, and associated facilities. Two gas turbines, one steam turbine and associated facilities (Units 1 and 2) were constructed and commenced commercial operation pursuant to the applicable Site Certification Agreement in 2008. The Certificate Holders are authorized to construct and operate two more gas turbines, another steam turbine and associated facilities (Units 3 and 4).

   b. The combustion turbine generators (CTGs) will be General Electric Frame 7FA turbines, with GE's Advanced Gas Path package, arranged in two 2x1 combined cycle configurations with General Electric D11 steam turbines. ~~Each combustion turbine unit will have a nominal capacity of 175 megawatts and shall have a heat recovery steam generator (HRSG). Each steam turbine generator (STG) will have a capacity of approximately 300 megawatts.~~ Dry Low NOx Combustors in combination with Selective Catalytic Reduction (SCR) shall be used to minimize the formation of nitrogen oxides (NOx). An oxidation catalyst shall be used to control carbon monoxide (CO) and volatile organic compounds (VOC) emissions. Cooling will be provided by two cooling towers, one consisting of nine cells (Units 1 and 2) and a second consisting of ten cells (Units 3 and 4).

   c. Natural gas will be used as the fuel. Natural gas will be delivered through a 48-mile pipeline, owned and operated by Northwest Pipeline Corporation.

   d. The electrical output of each unit will be delivered through the Bonneville Power Administration's high-voltage system to the existing Bonneville Power Administration Satsop substation.

2. This Site Certification Agreement authorizes the Certificate Holders to begin construction of Units 3 and 4 by February 18, 2028~~within ten (10) years of execution of Amendment No. 5~~. If construction of Units 3 and 4's major components has not

been commenced by that date, all rights under this Site Certification Agreement to construction and operation of Units 3 and 4 will cease.

~~If the Certificate Holders do not begin construction of Units 3 and 4 within five (5) years of the execution of Amendment No. 5,~~ Prior to commencing construction, the Certificate Holders will report to the Council their intention to do so and will certify that the representations in the application, environmental conditions, pertinent technology and regulatory conditions remain current and applicable, or identify any changes and propose appropriate revisions in the Site Certification Agreement to address changes. Construction may begin only upon prior Council authorization, upon the Council's finding that no changes to the Site Certification Agreement are necessary or appropriate, or upon the effective date of any necessary or appropriate changes to the Site Certification Agreement.

Further, ~~if the Certificate Holders do not begin construction and operation of Units 3 and 4 within five (5) years of the execution of Amendment No. 5 and the Council has adopted by rule changes to the standards governing "construction and operation of energy facilities" specified in WAC chapter 463-62,~~ the construction and operation of Units 3 and 4 will be governed by the regulations in effect at the time the Council authorizes construction to proceed.

ARTICLE III. GENERAL CONDITIONS

A. Legal Relationship

1. This Site Certification Agreement is made in lieu of any permit, certificate or similar document required by any department, agency, division, bureau, commission, board, or political subdivision of this state.

2. This Agreement shall bind the Certificate Holder, and its successors in interest, and the State and any of its departments, agencies, divisions, bureaus, commissions, boards, and its political subdivisions, subject to all the terms and conditions set forth herein, as to the approval of, and all activities undertaken with respect to, the Project or the Site. For regulatory purposes, the co-owners of the Project, Grays Harbor Energy LLC and Grays Harbor Energy II LLC, agree that they are jointly and severally responsible for the operation of the facility as a single entity under this Agreement, and for compliance with all provisions of this Site Certification Agreement. All references in this document to "certificate holder," "applicant," or similar term, unless the context requires otherwise, refers to either or both entities as their interests may appear, so as to provide seamless authority and responsibility for regulatory purposes. The Certificate Holder shall ensure that any activities undertaken with respect to the Project or the Site by its agents (including affiliates), contractors, and subcontractors comply with this Agreement. The term "affiliates" includes any other person or entity controlling, controlled by, or under common control of or with the Certificate Holder.

3. Liquid discharges from the project to navigable waters shall be made in accordance with the National Pollution Discharge Elimination System (NPDES) permit issued by the Council (Attachment II to this Agreement, or as reissued by the Council).

4. Emissions from Units 1 and 2 into the atmosphere of gases or substances will be made in accordance with the Prevention of Significant Deterioration (PSD) permit issued by the Council (Attachment V to this Agreement or as reissued by the Council). Emissions from Units 3 and 4 into the atmosphere of gases or substances will be made in accordance with the PSD permit issued by the Council (Attachment VI to this Agreement or as reissued by the Council).

5. This Site Certification Agreement is subject to federal laws and regulations applicable to the project and to the terms and conditions of any permits and licenses which may be issued to the Certificate Holders by appropriate federal agencies.

6. This document, which results from the cumulative actions of Project sponsors and the State of Washington as recited above, is intended to remove all superseded or irrelevant provisions and to incorporate all relevant existing provisions or conditions resulting from the original application, all applications for amendment, and all resolutions of the Council. To the extent any relevant provision is inadvertently omitted, it is nonetheless the intention of the parties to this document that such provision be interpreted to remain in full force and effect. In the event the Council identifies an inadvertent omission, it will promptly correct the omission by resolution.

7. This Site Certification Agreement constitutes the whole and complete agreement between the parties and supersedes any other negotiations, representations or agreements, whether written or oral, or not set forth herein.

B. Enforcement

1. This Site Certification Agreement may be enforced by means of all remedies available at law or in equity.

2. This Site Certification Agreement may be revoked, suspended, or modified by the State for failure by the Certificate Holders to comply with any of the terms and conditions attached, or for violations of Chapter 80.50 RCW, regulations issued there under, any applicable state or federal laws or regulations, or for violation of any order of the Council, pursuant to the provisions of Chapters 80.50 and 34.05 RCW and Title 463 WAC.

3. When any action of the Council is required by or authorized in this Site Certification Agreement, the Council may, but will not be required to, conduct a hearing pursuant to Chapter 34.05 RCW. If the Council grants a hearing to consider withholding or refusing approval of a required or requested action, the hearing will be conducted pursuant to Chapter 34.05 RCW.

C. Notices and Filings

Filing of any document or notice required by this Site Certification Agreement with the Council will be deemed to have been duly made when delivered to the Council's offices in Olympia, Washington. Notice to be served upon the Certificate Holders will be deemed to have been duly made when deposited in first class mail, postage prepaid, addressed to each Certificate Holder at the address on file with the Council.

D. Right of Inspection

The Certificate Holders agree to provide access to the Grays Harbor Energy Center and all associated facilities to designated representatives of the Council in the performance of their official duties.

E. Site Certification Agreement Compliance Monitoring and Costs

The Certificate Holders will pay to the Council such reasonable costs as are actually and necessarily incurred for the monitoring and compliance activities during the construction and operation of the project as authorized in this Site Certification Agreement and as required in Chapter 80.50 RCW. EFSEC will prescribe the amount and manner of such payment subject to applicable rules and procedures.

F. EFSEC Liaison

The Certificate Holders will designate one or more persons to act as a liaison between the Council and the Certificate Holders for matters relating to the Grays Harbor Energy Center. If the Certificate Holders designates more than one person, notice to or communication by the Council with one shall constitute notice to or communication with all.

G. Site Restoration

1. The Certificate Holders are responsible for site restoration pursuant to Council rules.

2. At least three months prior to beginning construction of Units 3 and 4, the Certificate Holders will present to the Council a modified site restoration plan reflecting the construction of Units 3 and 4, and showing any changes necessary to the previously approved site restoration plan in light of the construction and operation of those units. Construction of Units 3 and 4 may not begin until the Council has approved a plan adequately providing for site restoration and the funding of site restoration of the entire Grays Harbor Energy Center or any part thereof in the event the project is terminated before it has completed its planned useful operating life.

H. Modification of Site Certification Agreement

1. This Site Certification Agreement may be amended pursuant to Council rules and procedures then in effect, and in like manner as the development of the original Site Certification Agreement, including, but not limited to, obtaining approval of the Governor. Any amendments to this Site Certification Agreement will be made in writing. Alteration that does not substantially alter the substance of the Agreement may be accomplished by resolution of the Council pursuant to WAC 463-66-070. Alteration shall occur as a matter of law after five years if the Council adopts by rule changes to its standards governing "construction and operation for energy facilities" as specified in WAC 463-62 and the Certificate Holder has not then commenced construction of Units 3 and 4.

2. Any change of the terms or conditions of a PSD or NPDES Permit or this Site Certification Agreement required by federal law or regulations will be governed by applicable law and regulation and will not require modification of this Site Certification Agreement in the manner prescribed in H.1, above. Any changes in the terms or conditions of Attachment I – Site Legal Description; and Attachment III – Water Withdrawal Authorization; shall not require modification of this Site Certification Agreement in the manner prescribed in H.1 above, unless otherwise required by Council rules or regulations.

3. In circumstances where the Council believes that a significant degree of unforeseen adverse impact on the environment exists or is imminent as a result of the operation or condition of the Grays Harbor Energy Center, the Council may impose specific conditions or requirements upon the Certificate Holders in addition to the terms and conditions of this Site Certification Agreement as a consequence of those circumstances.

Such additional conditions or requirements will be effective only while needed to protect the public health, safety or welfare from the adverse circumstances, for not more than 90 days, and may be extended for additional 90-day periods if deemed necessary by the Council.

ARTICLE IV. PROJECT CONSTRUCTION

A. Construction Commencement and Reporting

1. Construction Schedule and Environmental Monitoring

a. Sixty days prior to beginning site preparation of Units 3 and 4, the Certificate Holders will submit an overall construction and site preparation schedule. The construction schedule will provide a good faith basis to believe that construction of Units 3 and 4 will be completed within twenty-two (22) months of beginning construction. After beginning construction, the Certificate Holders will submit a quarterly Construction Progress Report to the Council, within 30 days after the end of each calendar quarter until construction is completed.

b. The Certificate Holders agree to notify the Council immediately in the event of any significant change in the construction schedules on file with the Council.

c. EFSEC will retain, prior to commencement of site preparation and construction, a qualified firm or individual as environmental monitor. The environmental monitor will be available to assist in resolution of environmental concerns during construction; will verify that development complies with all conditions and requirements of this Agreement; and will personally inspect the site and the activities under this Agreement at appropriate intervals and stages to reasonably ensure compliance.

2. Plans and Specifications

a. The Certificate Holders will submit to EFSEC or its designated representative for approval, at the appropriate time, prior to the commencement of construction, those design documents that demonstrate compliance with all conditions and requirements of this Site Certification Agreement. The design documents will include, but are not limited to, conceptual design studies, flow diagrams, system descriptions, detailed design drawings and specifications as appropriate, and vendor guarantees for equipment and processes.

b. The Certificate Holders will design the proposed facility to comply with requirements for construction in Seismic Zone 3.

c. Project buildings and structures will comply with requirements of the approved design and construction plans, and the building code in effect at the time of construction.

B. Aesthetics and Landscaping

1. The Certificate Holders agree to construct Units 3 and 4 in a manner aesthetically compatible with the existing facility and the adjacent area.

2. One screening berm has been built and landscaped between the Grays Harbor Energy Center and Keys Road. The Certificate Holder will maintain the berm landscaping in an appropriate manner.

C. Surface Run-off and Erosion Control

1. The Certificate Holders will apply for coverage under a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit. The Certificate Holders will comply with all applicable permit requirements.

D. Transmission Lines

1. Associated transmission lines will connect the project to the Northwest Power grid at the Bonneville Power Administration Satsop Substation. The transmission lines will be placed in the existing Bonneville Power Administration rights of way.

2. All associated electrical transmission and service lines will comply in design and construction with all applicable state, federal, and industry standards. In the event of inconsistency among applicable standards, the most stringent standard will apply.

E. Construction Clean-Up

The Certificate Holders agree upon completion of construction to dispose of all temporary structures not required for future use. The Certificate Holders also agree to dispose of used timber or brush, refuse or flammable material resulting from the clearing of lands or from the construction of the project in a manner approved by the Council.

F. As-Built Drawings

The Certificate Holders agree to provide or to allow access by the Council or its designated representatives, on request, to complete sets of as-built drawings for the project.

G. Archaeological Site Protection

1. The Certificate Holders agree to coordinate with the Council and Tribes to develop an acceptable cultural resource monitoring plan, and will implement the plan during construction of the project.

2. The Certificate Holders agree to halt relevant construction activity immediately and report to the Council, Tribes and the Department of Archaeological and Historic Preservation all archaeological or historical findings made during the course of excavation and construction.

3. The Certificate Holders agree to consult with the Council to arrange for preservation of artifacts and for interpretation of any archaeological or historical site discovered in the course of any construction.

H. Construction Phase Spill Prevention and Countermeasures Plan

Three months prior to beginning construction of Units 3 and 4, the Certificate Holders will submit for Council review and approval any necessary modifications of the spill prevention and countermeasure plan that complies with applicable state and federal regulations and provisions of the project's NPDES permit. This program will address oil/chemical storage, containment, site security and personnel training. The program shall also address measures that will be taken to control and contain discharge, cleanup actions, notification of appropriate agencies and a list of available cleanup materials.

I. Septic System for the Project

The Certificate Holders shall be permitted to construct, maintain, and operate a septic system. The Certificate Holder will provide verification to the Council prior to commencement of construction of Units 3 and 4 that the septic system for the proposed expanded facility will comply with applicable county codes.

J. Noise during Construction

1. No construction activities are permitted on Sundays, legal holidays, or between 10:00 p.m. and 6:00 a.m. within 1000 feet of an occupied residential dwelling.

2. All construction equipment will have noise control devices no less effective than those provided originally by the equipment's manufacturer.

3. Pile driving or blasting operations shall not be permitted within 3,000 feet of an occupied residential dwelling on Sundays or legal holidays or between 8:00 p.m. and 8:00 a.m. on other days.

4. Notice of the proposed construction schedule and locations will be well publicized in the area, and nearby residents shall be notified in advance of the anticipated schedule for especially noisy activities, such as blasting or steam blows.

K. Construction Traffic

The Certificate Holders shall develop a Traffic Management Plan in consultation with the Grays Harbor County Department of Public Works, and submit it to the Council for approval. The plan shall include measures to encourage construction traffic to use the Wakefield- Lakefield corridor to minimize traffic at the Highway 12-Keys Road intersection, address pedestrian traffic leaving the construction site, and provide for reasonable access to side roads during periods when project-related traffic or construction equipment may impede such access.

L. Fugitive Dust

Fugitive dust will be controlled by spraying water on dry earth in the active construction areas.

ARTICLE V. OPERATION OF THE PROJECT

A. Water Withdrawal

1. The Certificate Holders are hereby authorized to withdraw water to be used for the operation of the project as follows:

   For Units 1 and 2, the Grays Harbor Energy Center is authorized to withdraw a total of 9.2 cubic feet per second of water from the Ranney wells pursuant to the water authorization in Attachment III, incorporated by this reference. If needed, the Certificate Holders may obtain additional water from another valid water right holder, such as the Grays Harbor Public Development Authority ("PDA").

   Following construction of Units 3 and 4 of the Grays Harbor Energy Center, the Certificate Holders may withdraw up to a total of 16 cubic feet per second of water. This water may be supplied through a combination of withdrawals authorized by Attachment III and water obtained from another valid water right holder. The Certificate Holders will notify EFSEC of the source of water to be used for operation of the facility prior to commencing construction of Units 3 and 4, and prior to any change in the source of water.

2. The Certificate Holders are authorized to withdraw up to 300 gallons per minute from ground water in an area near the confluence of the Chehalis and Satsop rivers from a well-known as the raw water well. Withdrawal of water from this well for any uses other than domestic supply and fire suppression will be limited to 300 gallons per minute and will be limited by restrictions set forth in Attachment III on withdrawals during periods of low flows.

3. Should the withdrawal for operation of the project impair senior water rights, the Certificate Holders agree to compensate the holder of such rights for the impairment, and to take necessary measures to prevent recurrence or continuation of such impairment.

4. Withdrawal of water pursuant to Attachment III will be adjusted as necessary to ensure that the project does not affect the minimum base flows immediately downstream of the point of diversion. The required minimum base flows are established in Chapter 173-522-020, Washington Administrative Code, and set forth in Attachment III. This authorization is also subject to the provisions of Chapter 173-
   522 and Chapter 173-500, Washington Administrative
   Code.

5. During periods in which the withdrawal restrictions set forth in Attachment III are in effect, the Certificate Holders may continue to operate the Grays Harbor Energy Center using water purchased from the PDA or from other water rights holders, so long as the water purchased is derived from water rights that are not

subject to base flow restrictions. The Certificate Holders will submit annual reports to EFSEC, Ecology and WDFW indicating when base-flow restrictions were in effect, and describing the measures taken to comply with the base flow restrictions during those periods.

6. The Certificate Holders may use stored water in order to provide the necessary water for the project during the low flow periods set forth in Attachment III, or may obtain water from other holders of valid water rights that are not subject to minimum base flow requirements.

B. Water Discharge

All discharges by the Certificate Holders to state waters shall be in accordance with Chapter 90.48 RCW, this Site Certification Agreement, and the NPDES Permit, as issued by the Council and attached hereto as Attachment II, and as may be later amended by the Council.

C. Emissions Into Air

1. The Certificate Holders will operate Units 1 and 2 of the project so that all emissions to the atmosphere will comply with the Approval of Notice of Construction and Prevention of Significant Deterioration Application as set forth in Attachment V, attached and incorporated by this reference. The Certificate Holders will operate Units 3 and 4 so that all emissions to the atmosphere will comply with the Approval and Notice of Construction and Prevention of Significant Deterioration Application as set forth in Attachment VI, attached and incorporated by this reference.

2. The Certificate Holders will properly operate and maintain in good working order all air pollution control equipment and monitoring equipment required in Attachments V and VI.

3. The Certificate Holders will be subject to the time limitations for construction and renewal conditions as set forth in Attachments V and VI.

D. Lighting

In specific locations where glare or light spillover would impact Keys Road or be visible to nearby residences, lighting angles will be adjusted to minimize glare impacts, or supplemental light shields/vegetation will be used for extra screening.

The Certificate Holders will minimize nighttime lighting that is not essential for operations, safety and security, and will direct lighting downward or install shielding where practical.

E. Noise during Operation

1. Units 1 and 2 have been designed and constructed so that the combustion turbines and several other major sources of sound are enclosed within structures containing acoustical damping and/or surrounded by acoustical enclosures or walls. Acoustically absorptive insulation has been installed on the duct walls of the combustion turbine air intake system; silencers have been installed in the air flow path of the enclosure ventilating systems, and acoustically absorptive silencers have been installed on several emergency relief valves. By June 15, 2011, the Certificate Holders will install the following additional acoustical mitigation devices on Units 1 and 2:

   - Acoustical walls around the combustion turbine exhaust transition pieces;
   - Silencers in four combustion turbine enclosure ventilation systems; and
   - Silencers on one auxiliary steam relief valve and four cold reheat steam valves.

   Within six months after installation of additional acoustic devices specified above, the Certificate Holder must conduct a least-cost verification noise study of Units 1 & 2. Prior to conducting the study, the Certificate Holder must submit the least-cost verification study plan to the Council for approval.

2. The project will comply with the maximum noise limits set forth in WAC 173-60-040, as adopted by the Council in WAC 463-62-030. If the Certificate Holder begins construction of Units 3 and 4 more than five (5) years after the execution of Amendment No.5, and in the interim, the Council has amended the noise standard set forth in WAC 463-62-030, the amended standard will apply to the expanded project.

3. Before commencement of construction of Units 3 and 4, and in adequate time to incorporate sound suppression measures into the development of design of Units 3 and 4, the Certificate Holders will retain a qualified acoustical specialist to conduct a field study of Units 1 and 2 to identify additional, reasonable, cost-effective mitigation measures that could be implemented with the construction of Units 3 and 4 to further reduce project noise below the maximum noise limits. The field study will focus on reducing or avoiding sounds annoying nearby residents, rather than merely on reducing A-weighted decibel levels. The Certificate Holder will submit the draft study report to the Council for its review.

4. The Certificate Holders will retain an acoustical specialist to take noise measurements during performance testing of Units 3 and 4 prior to commercial operation. The results of these measurements will be used to determine whether additional acoustical barriers are necessary along the property boundaries, or if in-lieu mitigation waivers are needed from adjacent property owners.

5. After commencement of commercial operation of Units 3 and 4, the Certificate Holders will retain a qualified acoustical specialist to conduct a noise monitoring study to determine whether the expanded facility complies with the maximum noise limits set forth in WAC 173-60-040, as adopted by the Council in WAC 463-62-030.

6. The Certificate Holders have implemented a procedure for recording and responding to communications from nearby residents concerning project noise. The Certificate Holder will report to the Council on a monthly basis regarding noise complaints, responses and follow-up actions.

7. Irrespective of whether the volume of resulting noise is above or below the applicable regulatory noise limits, the Certificate Holders shall maintain all noise suppression equipment and features in good working order and shall use them during all relevant operations of the Project.

ARTICLE VI. PUBLIC AND ENVIRONMENTAL PROTECTION

A. Emergency Plans

The Certificate Holders will develop an Emergency Response Plan describing the methods, means, and resources available to provide for employee safety in the event of emergencies including fire or explosions, in association with the project. No later than three months prior to first operation of the combustion turbines, the plan will be submitted for Council review and approval. In preparing the plan, the Certificate Holders must agree to:

1. Coordinate such plan with local, state and federal agencies directly involved in implementing such a plan.

2. Follow the requirements of WAC 296-24-567 and 296-62-3112 and 29 CFR 1910.38, Emergency Action Plan.

3. Include detailed provisions for public health and safety, emergency medical treatment, special emergency training programs and prevention of property damage.

4. Provide the Council with lists of emergency personnel, communication channels and procedures, and update the information when any changes occur.

5. All employees, contractors, and visitors will be covered by the plan.

6. The Certificate Holder will update the plan and submit it to the Council every two years from the date of the approved amendment.

B. Security Plan

The Certificate Holders will submit a comprehensive physical Security Plan for the protection of the site and project facilities.

C. Spill Prevention Control and Countermeasure Plan

The Certificate Holders will maintain and implement a Spill Prevention, Control and Countermeasure (SPCC) Plan, approved by the Council, consistent with the requirements of the NPDES Permit and with requirements of applicable state and federal laws and rules. The SPCC plan is to be approved by a Professional Engineer and include the amount and type of oils and hazardous materials to be stored at the project site, patterns of usage, transfer procedures and other factors which will indicate the magnitude of spill notification requirements. This SPCC plan shall also describe procedures for securing valves, type of gauges, dike size and design, site security, lighting, alarms, spill response materials and equipment, inspection procedures, personnel training, emergency procedures and spill notification requirements. This SPCC plan shall be submitted to the Council and its designated representatives within one year of beginning construction of the project, and shall be updated at intervals no longer than every two years.

D. Explosions

The Project will be equipped with detectors to provide warning of the release of flammable or explosive gases. The detection system must be described in the final design plans.

ARTICLE VII. MISCELLANEOUS PROVISIONS

A. Discharge of Pollutants

All discharges into waters of the State of Washington must comply with the requirements of an NPDES Permit issued by the Council, pursuant to Chapter 90.48 RCW.

B. Greenhouse Gases and Carbon Dioxide Mitigation

1. The Council has approved a mitigation plan for carbon dioxide emissions associated with the operation of Units 1 and 2.

2. If a comprehensive federal or state mitigation program is implemented, the Council reserves the right to exercise its authority under that program considering and appropriately crediting any measures that the Certificate Holders have accomplished.

3. The Certificate Holders are required to mitigate carbon dioxide emissions from Units 3 and 4 in accordance with RCW chapter 80.70 and Chapter 463-80 WAC. Within 120 days of commencing commercial operation of Units 3 and 4, the Certificate Holders will make a mitigation payment to an independent qualified organization approved by EFSEC in an amount that satisfies the mitigation obligation. Certificate Holders will require the independent qualified organization to consult with Grays Harbor County and provide preference and priority for mitigation projects located within Grays Harbor County.

4. Attachment VII to this Agreement contains preliminary calculations determining the amount of carbon dioxide mitigation payments to be made by Certificate Holders.

C. Attachments

Attachments hereto by this reference are included in the Site Certification Agreement:

I. Site Legal Description

II. National Pollution Discharge Elimination System Permit

III. Water Withdrawal Authorization

IV. GHE Noise Mitigation Commitment Letters of July 9, 2010 and August 30, 2010.

V. Final Approval Notice of Construction and Prevention of Significant Deterioration Application for Units 1 and 2

VI. Final Approval Notice of Construction and Prevention of Significant Deterioration Application for Units 3 and 4

VII. Carbon Dioxide Mitigation Calculations

VIII. Errata Sheet – February 2011

SIGNATURES

Dated and effective this ___, day of _____, 2020.

FOR THE STATE OF
WASHINGTON

Governor Christine Gregoire

FOR GRAYS HARBOR ENERGY LLC

_____

FOR GRAYS HARBOR ENERGY II LLC

_____