

DOCKETED

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Appendix 5.1A
Support Data for Emissions
Calculations

APPENDIX 5.1A

Calculation of Maximum Hourly, Daily, and Annual Emissions

Tables presented in this Appendix are as follows:

5.1A-1	Turbine Performance Run Data and Emissions Estimates
5.1A-2	SF6 Emissions Estimates
5.1A-3	Natural Gas Analysis
5.1A-4	Turbine HAPs Emissions Estimates
5.1A-5	Commissioning Operations and Emissions Data

In addition to the above tables, other miscellaneous support data for the device-specific emissions calculations may also be included in this Appendix.

**Table 5.1A-1
Turbine Performance Run Data and Emissions Estimates
(14 pages)**



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Maximum Annual & Monthly Emissions - Normal Year

Annual Emissions					
Case Number	1	2	3	Maximum for Air Permit	Maximum for RTC's, ERC's or Mitigation
Description	866 Total Hours - 500 Starts	1076 Total Hours - 100 Starts	(not used)		
Include in RTC, ERC, Mitigation Calc.?	Yes	Yes	No		
NO _x , tons as NO ₂	3.89	3.88	-	3.89	3.89
CO, tons	7.88	5.36	-	7.88	7.88
VOC, tons as CH ₄	1.26	0.74	-	1.26	1.26
PM10, tons	1.69	2.08	-	2.08	2.08
SO ₂ , tons	0.25	0.35	-	0.35	0.35
CO ₂ , tons	41,762	58,324	-	58,324	58,324
Total Fuel, MMBtu (HHV)	712,109	988,317	-	988,317	988,317

Monthly Emissions					
Case Number	1	2	3	Maximum for Air Permit	Maximum for ERC's or Mitigation
Description	72 Total Hours - 41 Starts	83 Total Hours - 21 Starts	(not used)		
Include in ERC Calc.?	Yes	Yes	No		
NO _x , tons as NO ₂	0.32	0.32	-	0.32	0.32
CO, tons	0.65	0.44	-	0.65	0.65
VOC, tons as CH ₄	0.10	0.06	-	0.10	0.10
PM10, tons	0.14	0.17	-	0.17	0.17
SO ₂ , tons	0.02	0.03	-	0.03	0.03
CO ₂ , tons	3,480	4,850	-	4,850	4,850
Total Fuel, MMBtu (HHV)	59,333	82,176	-	82,176	82,176

Emission Reduction Credits/Mitigation					
Pollutant	Maximum Annual Emissions (tpy)	Maximum Monthly Emissions (lbs/day)	Offset Ratio X:1	RTC's Required (tpy)	ERC's Required (lbs/day)
NO _x , as NO ₂	3.89	21.5	1.0	-	-
CO	7.88	43.4	0.0	-	-
VOC, as CH ₄	1.26	6.9	1.0	-	-
PM10	2.08	11.5	1.0	-	-
SO _x , as SO ₂	0.35	1.9	1.0	-	-
CO ₂	58,324	323,310	0.0		
Total					



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Annual Emissions Case 1

Plant Dispatch		Proposed Limits
Combustion Turbines (per unit unless noted)		
Number of Turbines	2	
Minimum Load Hours - Average Ambient Conditions	-	
50% Load Hours - Average Ambient Conditions	-	
Base Load Hours - Average Ambient Conditions	716	
Total Starts	500	
Total Shutdowns	500	
Startup/Shutdown Hours	150	
Total Hours of Operation	866	
Offline Hours	7,894	
Annual Fuel Use, MMBtu (HHV) (all units)	712,109	988,317
Combustion Turbine Emissions		Proposed Limits
Minimum Load - Average Ambient Conditions		
NO _x , tons as NO ₂	-	
CO, tons	-	
VOC, tons as CH ₄	-	
PM10, tons	-	
SO ₂ , tons	-	
CO ₂ , tons	-	
50% Load - Average Ambient Conditions		
NO _x , tons as NO ₂	-	
CO, tons	-	
VOC, tons as CH ₄	-	
PM10, tons	-	
SO ₂ , tons	-	
CO ₂ , tons	-	
Base Load - Average Ambient Conditions		
NO _x , tons as NO ₂	1.2	
CO, tons	1.5	
VOC, tons as CH ₄	0.2	
PM10, tons	0.7	
SO ₂ , tons	0.1	
CO ₂ , tons	19,810	
Startups/Shutdowns		
NO _x , tons as NO ₂	0.7	
CO, tons	2.4	
VOC, tons as CH ₄	0.4	
PM10, tons	0.2	
SO ₂ , tons	0.0	
CO ₂ , tons	1,071	
Total Emissions (each unit)		
NO _x , tons as NO ₂	1.9	
CO, tons	3.9	
VOC, tons as CH ₄	0.6	
PM10, tons	0.8	
SO ₂ , tons	0.1	
CO ₂ , tons	20,881	
Total Plant Emissions		Proposed Limits
NO _x , tons as NO ₂	3.89	3.89
CO, tons	7.88	7.88
VOC, tons as CH ₄	1.26	1.26
PM10, tons	1.69	2.08
SO ₂ , tons	0.25	0.35
CO ₂ , tons	41,762	58,324



Stanton 2x0
Annual Emissions Case 2

Plant Dispatch		Proposed Limits
Combustion Turbines (per unit unless noted)		
Number of Turbines	2	
Minimum Load Hours - Average Ambient Conditions	-	
50% Load Hours - Average Ambient Conditions	-	
Base Load Hours - Average Ambient Conditions	1,046	
Total Starts	100	
Total Shutdowns	100	
Startup/Shutdown Hours	30	
Total Hours of Operation	1,076	
Offline Hours	7,684	
Annual Fuel Use, MMBtu (HHV) (all units)	988,317	988,317
Combustion Turbine Emissions		Proposed Limits
Minimum Load - Average Ambient Conditions		
NO _x , tons as NO ₂	-	
CO, tons	-	
VOC, tons as CH ₄	-	
PM10, tons	-	
SO ₂ , tons	-	
CO ₂ , tons	-	
50% Load - Average Ambient Conditions		
NO _x , tons as NO ₂	-	
CO, tons	-	
VOC, tons as CH ₄	-	
PM10, tons	-	
SO ₂ , tons	-	
CO ₂ , tons	-	
Base Load - Average Ambient Conditions		
NO _x , tons as NO ₂	1.8	
CO, tons	2.2	
VOC, tons as CH ₄	0.3	
PM10, tons	1.0	
SO ₂ , tons	0.2	
CO ₂ , tons	28,948	
Startups/Shutdowns		
NO _x , tons as NO ₂	0.1	
CO, tons	0.5	
VOC, tons as CH ₄	0.1	
PM10, tons	0.0	
SO ₂ , tons	0.0	
CO ₂ , tons	214	
Total Emissions (each unit)		
NO _x , tons as NO ₂	1.9	
CO, tons	2.7	
VOC, tons as CH ₄	0.4	
PM10, tons	1.0	
SO ₂ , tons	0.2	
CO ₂ , tons	29,162	
Total Plant Emissions		Proposed Limits
NO _x , tons as NO ₂	3.88	3.89
CO, tons	5.36	7.88
VOC, tons as CH ₄	0.74	1.26
PM10, tons	2.08	2.08
SO ₂ , tons	0.35	0.35
CO ₂ , tons	58,324	58,324



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Short-Term Emissions

Maximum Hour Excluding Startups & Shutdowns		Notes
Combustion Turbines (each unit)		
NO _x , lbs as NO ₂	4.46	Base Load @ Min. Ambient Conditions, Max. NOx ppm
CO, lbs	4.34	Base Load @ Min. Ambient Conditions, Max. CO ppm
VOC, lbs as CH ₄	0.62	Base Load @ Min. Ambient Conditions, Max. VOC ppm
PM10, lbs	3.00	Base Load @ Min. Ambient Conditions, Max. PM10 lbs/hr
SO ₂ , lbs	1.02	Base Load @ Min. Ambient Conditions, Max. Sulfur Content
Total		
NO _x , lbs as NO ₂	8.92	2 CT's - Base Load @ Min. Ambient Conditions, Max. NOx ppm
CO, lbs	8.69	2 CT's - Base Load @ Min. Ambient Conditions, Max. CO ppm
VOC, lbs as CH ₄	1.24	2 CT's - Base Load @ Min. Ambient Conditions, Max. VOC ppm
PM10, lbs	6.00	2 CT's - Base Load @ Min. Ambient Conditions, Max. PM10 lbs/hr
SO ₂ , lbs	2.04	2 CT's - Base Load @ Min. Ambient Conditions, Max. Sulfur Content
Maximum Hour Including Startups & Shutdowns		Notes
Combustion Turbines (each unit)		
NO _x , lbs as NO ₂	6.68	2 Startups (15 min ea.), 2 Shutdowns (10 min ea.), & Base Load @ Min. Ambient Conditions (10 min) & Max. NOx ppm
CO, lbs	13.23	2 Startups (15 min ea.), 2 Shutdowns (10 min ea.), & Base Load @ Minimum Ambient Conditions (10 min) & Max. CO ppm
VOC, lbs as CH ₄	2.19	2 Startups (15 min ea.), 2 Shutdowns (10 min ea.), & Base Load @ Minimum Ambient Conditions (10 min) & Max. VOC ppm
PM10, lbs	3.00	Base Load @ Min. Ambient Conditions, Max. PM10 lbs/hr
SO ₂ , lbs	1.02	Base Load @ Min. Ambient Conditions, Max. Sulfur Content
Total		
NO _x , lbs as NO ₂	13.36	2 CT's - 2 Startups (15 min ea.), 2 Shutdowns (10 min ea.), & Base Load @ Min. Ambient Conditions (10 min) & Max. NOx ppm
CO, lbs	26.45	2 CT's - 2 Startups (15 min ea.), 2 Shutdowns (10 min ea.), & Base Load @ Min. Ambient Conditions (10 min) & Max. CO ppm
VOC, lbs as CH ₄	4.37	2 CT's - 2 Startups (15 min ea.), 2 Shutdowns (10 min ea.), & Base Load @ Min. Ambient Conditions (10 min) & Max. VOC ppm
PM10, lbs	6.00	2 CT's - Base Load @ Min. Ambient Conditions, Max. PM10 lbs/hr
SO ₂ , lbs	2.04	2 CT's - Base Load @ Min. Ambient Conditions, Max. Sulfur Content
Maximum 3-Hours Including Startups & Shutdowns		Notes
Combustion Turbines (each unit)		
SO ₂ , lbs	3.06	Base Load @ Min. Ambient Conditions, Max. Sulfur Content
Total		
SO ₂ , lbs	6.11	2 CT's - Base Load @ Min. Ambient Conditions, Max. Sulfur Content
Maximum 8-Hours Including Startups & Shutdowns		Notes
Combustion Turbines (each unit)		
CO, lbs	61.40	4 Startups (15 min ea.), 4 Shutdowns (10 min ea.), & Base Load @ Min. Ambient Conditions (380 min)
Total		
CO, lbs	122.80	4 Startups (15 min ea.), 4 Shutdowns (10 min ea.), & Base Load @ Min. Ambient Conditions (380 min)
Maximum 24-Hours Including Startups & Shutdowns		Notes
Combustion Turbines (each unit)		
NO _x , lbs as NO ₂	115.91	6 Startups (15 min ea.), Base Load @ Min. Ambient Conditions (1290 min), & 6 Shutdowns (10 min ea.)
CO, lbs	133.00	6 Startups (15 min ea.), Base Load @ Min. Ambient Conditions (1290 min), & 6 Shutdowns (10 min ea.)
VOC, lbs as CH ₄	21.93	6 Startups (15 min ea.), Base Load @ Min. Ambient Conditions (1290 min), & 6 Shutdowns (10 min ea.)
PM10, lbs	72.00	Base Load @ Min. Ambient Conditions, Max. PM10 lbs/hr
SO ₂ , lbs	24.46	Base Load @ Min. Ambient Conditions, Max. Sulfur Content
Total		
NO _x , lbs as NO ₂	231.82	2 CT's - 4 Startups (15 min ea.), Base Load @ Min. Ambient Conditions (1340 min), & 4 Shutdowns (10 min ea.)
CO, lbs	265.99	2 CT's - 4 Startups (15 min ea.), Base Load @ Min. Ambient Conditions (1340 min), & 4 Shutdowns (10 min ea.)
VOC, lbs as CH ₄	43.86	2 CT's - 4 Startups (15 min ea.), Base Load @ Min. Ambient Conditions (1340 min), & 4 Shutdowns (10 min ea.)
PM10, lbs	144.00	2 CT's - Base Load @ Min. Ambient Conditions, Max. PM10 lbs/hr
SO ₂ , lbs	48.91	2 CT's - Base Load @ Min. Ambient Conditions, Max. Sulfur Content



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Combustion Turbine Stack Sizing

Stack Diameter, ft	
Maximum Exhaust Flow, lb/hr	1,123,077
Stack Temperature, deg. F	827
Exhaust Molecular Weight	28.44
Site Elevation, ft	72.0
Ambient Pressure, psia	14.66
Target Maximum Velocity, fps	75.0
Minimum Stack Diameter, ft	13.24
Equivalent Stack Inside Diameter, ft	12.04
Square Stack Inside Dimension, ft x ft	10.67
Actual Maximum Velocity, fps	90.8
Stack Height	
Finished Grade to Top of Foundation, ft	0.70
Top of Foundation to Top of Breeching, ft	19.33
Stack Damper, ft	-
Stack Silencer, ft	18.00
Stack Silencer Reducer, ft	1.31
Last Disturbance to Test Ports, diameters	2.00
Test Ports to Stack Outlet, diameters	0.50
Minimum Stack Height, ft (above top of foundation)	68.74
Selected Stack Height, ft (above top of foundation)	70.00
Selected Stack Height, ft (above finished grade)	70.70
Top of Stack Elevation, ft	142.70
Stack Height to Breeching Height Ratio	3.6

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Combustion Turbine Assumptions

Plant Design Parameters		
Combustion Turbine Manufacturer	GE	
Combustion Turbine Model	LM6000PC-SPRINT	
Plant Cycle	Simple Cycle	
Stack Diameter, ft	12.04	
Stack Height, ft	71	
Sulfate Particulate Molecular Weight	134	
Sulfate Particulate Conversion Rate in CTG	5%	
Tempering and Purge Air		
Tempering Air Required? (Yes/No)	No	
Design Exhaust Temperature Upstream of Catalysts, deg. F	830	
Purge Air Required? (Yes/No)	Yes	
Purge Air Flow, acfm	6,815	
CO Catalyst Assumptions		
CO Catalyst Required? (Yes/No)	Yes	
Maximum Outlet CO, ppmvd @ 15% O ₂	4.0	
Annual Average Outlet CO, ppmvd @ 15% O ₂	4.0	
Maximum Outlet VOC, ppmvd as CH ₄ @ 15% O ₁	1.0	
Annual Average Outlet VOC, ppmvd as CH ₄ @ 15% O ₂	0.9	
Minimum VOC Reduction across CO Catalyst	0%	
Sulfate Particulate Conversion Rate across CO Catalyst	80%	
NO _x Catalyst Assmptions		
NO _x Catalyst Required? (Yes/No)	Yes	
Maximum Outlet NO _x , ppmvd @ 15% O ₂	2.5	
Annual Average Outlet NO _x , ppmvd @ 15% O ₂	2.0	
Maximum Ammonia Slip, ppmvd @ 15% O ₂	5	
Sulfate Particulate Conversion Rate across SCR Catalyst	10%	
CT PM10 Assumptions		
Natural Gas - lbs/MMBtu (HHV)	0.00413	

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Combustion Turbine Operating Emissions and Support Data

		Hot Ambient Conditions			Average Ambient Conditions			Cold Ambient Conditions		
		Case 100	Case 101	Case 102	Case 103	Case 104	Case 105	Case 106	Case 107	Case 108
		Base	Mid	Min	Base	Mid	Min	Base	Mid	Min
Operating Conditions										
Ambient Dry Bulb Temp.	deg. F	102.7	102.7	102.7	65.0	65.0	65.0	40.0	40.0	40.0
Ambient Wet Bulb Temp.	deg. F	69.0	69.0	69.0	59.3	59.3	59.3	36.4	36.4	36.4
Relative Humidity	%	17.0%	17.0%	17.0%	72.0%	72.0%	72.0%	71.4%	71.4%	71.4%
Elevation	ft	73	73	73	73	73	73	73	73	73
Ambient Pressure	psia	14.657	14.657	14.657	14.657	14.657	14.657	14.657	14.657	14.657
Combustion Turbine Load	%	100%	50%	21%	100%	50%	21%	100%	50%	20%
Combustion Turbines Operating		1	1	1	1	1	1	1	1	1
Evap Cooling or Fogging? (Yes/No)		Yes	No	No	Yes	No	No	No	No	No
Evap Cooling/Fogging Effectiveness	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Performance Water Injection? (Yes/No)		Yes	No	No	Yes	No	No	Yes	No	No
NO _x Control Water Injection? (Yes/No)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fuel Input (each CT)										
Fuel Type		Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CT Fuel (LHV)	MMBtu/hr	408.8	248.0	166.7	422.7	253.1	163.9	436.9	259.8	164.8
Total Fuel (LHV)	MMBtu/hr	408.8	248.0	166.7	422.7	253.1	163.9	436.9	259.8	164.8
HHV/LHV =		1.1083	1.1083	1.1083	1.1083	1.1083	1.1083	1.1083	1.1083	1.1083
CT Fuel (HHV)	MMBtu/hr	453.1	274.9	184.7	468.5	280.5	181.6	484.2	287.9	182.6
Total Fuel (HHV)	MMBtu/hr	453.1	274.9	184.7	468.5	280.5	181.6	484.2	287.9	182.6
CT Fuel	lb/hr	20,099	12,193	8,196	20,782	12,444	8,058	21,480	12,773	8,102
Total Fuel	lb/hr	20,099	12,193	8,196	20,782	12,444	8,058	21,480	12,773	8,102
Inlet Air (each CT)										
N ₂	mole % dry	78.04%	78.04%	78.04%	78.04%	78.04%	78.04%	78.04%	78.04%	78.04%
O ₂	mole % dry	20.99%	20.99%	20.99%	20.99%	20.99%	20.99%	20.99%	20.99%	20.99%
CO ₂	mole % dry	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
Ar	mole % dry	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Molecular Weight, dry air		28.97	28.97	28.97	28.97	28.97	28.97	28.97	28.97	28.97
Dry Bulb Temperature	deg. F	69.0	102.7	102.7	59.3	65.0	65.0	40.0	40.0	40.0
Moisture Content of Ambient Air	lb H ₂ O/lb dry air	0.0075	0.0075	0.0075	0.0095	0.0095	0.0095	0.0037	0.0037	0.0037
Moisture Content of Inlet Air	lb H ₂ O/lb dry air	0.0153	0.0075	0.0075	0.0108	0.0095	0.0095	0.0037	0.0037	0.0037
Relative Humidity of Inlet Air	%	100%	17%	17%	100%	72%	72%	71%	71%	71%
Moisture Content	moles H ₂ O/mole air	0.025	0.012	0.012	0.017	0.015	0.015	0.006	0.006	0.006
N ₂	mole %	76.16%	77.10%	77.10%	76.70%	76.86%	76.86%	77.58%	77.58%	77.58%
O ₂	mole %	20.49%	20.74%	20.74%	20.63%	20.67%	20.67%	20.87%	20.87%	20.87%
CO ₂	mole %	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
H ₂ O	mole %	2.40%	1.20%	1.20%	1.71%	1.51%	1.51%	0.60%	0.60%	0.60%
Ar	mole %	0.92%	0.93%	0.93%	0.92%	0.93%	0.93%	0.93%	0.93%	0.93%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Molecular Weight		28.70	28.84	28.84	28.78	28.80	28.80	28.90	28.90	28.90
Inlet Air Flow (wet)	lb/hr	976,285	741,406	565,794	1,001,758	795,395	610,964	1,041,947	850,140	650,612
Inlet Air Flow (dry)	lb/hr	961,551	735,851	561,555	991,019	787,892	605,201	1,038,081	846,986	648,198
Performance Water Injection (each CT)										
Water Injection Flow	lb/hr	9,323	0	0	9,571	0	0	3,792	0	0
NO_x Control Water Injection (each CT)										
Water Injection Flow	lb/hr	16,699	11,647	5,712	18,324	10,217	4,421	23,557	10,725	4,548
Combustion Turbine Exhaust (each CT)										
Excess Combustion Air	%	194.7%	271.7%	322.0%	193.7%	290.0%	362.6%	197.6%	308.4%	392.7%
N ₂	lb/hr	726,344	555,776	424,106	748,607	595,067	457,049	784,151	639,683	489,508
O ₂	lb/hr	147,180	124,627	99,280	151,437	135,742	109,910	159,715	148,195	119,707
CO ₂	lb/hr	53,517	32,536	21,900	55,335	33,222	21,557	57,200	34,119	21,693
H ₂ O	lb/hr	82,897	42,766	27,135	82,206	43,810	27,080	76,249	40,659	23,949
Ar	lb/hr	12,468	9,541	7,281	12,850	10,216	7,847	13,460	10,982	8,405
Total Exhaust Flow	lb/hr	1,022,406	765,246	579,702	1,050,435	818,056	623,443	1,090,776	873,638	663,262
Manufacturer's Exhaust Flow	lb/hr	1,022,406	765,246	579,702	1,050,435	818,056	623,443	1,090,776	873,638	663,262
N ₂	mass %	71.04%	72.63%	73.16%	71.27%	72.74%	73.31%	71.89%	73.22%	73.80%
O ₂	mass %	14.40%	16.29%	17.13%	14.42%	16.59%	17.63%	14.64%	16.96%	18.05%
CO ₂	mass %	5.23%	4.25%	3.78%	5.27%	4.06%	3.46%	5.24%	3.91%	3.27%
H ₂ O	mass %	8.11%	5.59%	4.68%	7.83%	5.36%	4.34%	6.99%	4.65%	3.61%
Ar	mass %	1.22%	1.25%	1.26%	1.22%	1.25%	1.26%	1.23%	1.26%	1.27%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
N ₂	moles/hr	25,923	19,835	15,136	26,717	21,238	16,312	27,986	22,830	17,470
O ₂	moles/hr	4,605	3,899	3,106	4,738	4,246	3,438	4,997	4,636	3,744
CO ₂	moles/hr	1,219	741	499	1,261	757	491	1,303	777	494
H ₂ O	moles/hr	3,674	1,727	1,189	3,546	1,865	1,258	2,925	1,662	1,077
Ar	moles/hr	312	239	182	322	256	196	337	275	210
Total	moles/hr	35,733	26,441	20,112	36,583	28,361	21,695	37,548	30,179	22,996
N ₂	mole %	72.55%	75.02%	75.26%	73.03%	74.88%	75.19%	74.53%	75.65%	75.97%
O ₂	mole %	12.89%	14.74%	15.44%	12.95%	14.97%	15.31%	13.31%	15.36%	16.28%
CO ₂	mole %	3.41%	2.80%	2.48%	3.45%	2.67%	2.26%	3.47%	2.58%	2.15%
H ₂ O	mole %	10.28%	6.53%	5.91%	9.69%	6.57%	5.80%	7.79%	5.51%	4.68%
Ar	mole %	0.87%	0.90%	0.91%	0.88%	0.90%	0.91%	0.90%	0.91%	0.91%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Molecular Weight		28.15	28.50	28.54	28.22	28.49	28.54	28.43	28.60	28.65

Stanton 2x0

Combustion Turbine Operating Emissions and Support Data

		Hot Ambient Conditions			Average Ambient Conditions			Cold Ambient Conditions		
		Case 100	Case 101	Case 102	Case 103	Case 104	Case 105	Case 106	Case 107	Case 108
		Base	Mid	Min	Base	Mid	Min	Base	Mid	Min
CT Emissions (each CT) - Expected										
NO _x @ 15% O ₂	ppmvd	25	25	25	25	25	25	25	25	25
CO @ 15% O ₂	ppmvd	7	14	13	11	18	15	33	37	31
VOC @ 15% O ₂	ppmvd	2	2	2	2	2	2	4	4	3
NO _x as NO ₂	lb/hr	41.5	25.1	16.7	43.0	25.5	16.4	44.6	26.1	16.4
CO	lb/hr	7.4	8.6	5.1	11.7	11.2	6.0	35.7	23.8	12.2
VOC, as CH ₄	lb/hr	1.3	0.8	0.5	1.4	0.8	0.5	2.3	1.6	0.8
PM10	lb/hr	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Portion of PM10 from Sulfur Particulates	lb/hr	0.10	0.06	0.04	0.10	0.06	0.04	0.11	0.06	0.04
Portion of PM10 from Soot/Ash	lb/hr	2.9	2.9	3.0	2.9	2.9	3.0	2.9	2.9	3.0
Maximum SO ₂	lb/hr	1.0	0.6	0.4	1.0	0.6	0.4	1.0	0.6	0.4
Annual Average SO ₂	lb/hr	0.3	0.2	0.1	0.3	0.2	0.1	0.3	0.2	0.1
Tempering and Purge Air (each CT)										
Moisture Content	lb H ₂ O/lb air	0.0075	0.0075	0.0075	0.0095	0.0095	0.0095	0.0037	0.0037	0.0037
Moisture Content	moles H ₂ O/mole air	0.0121	0.0121	0.0121	0.0153	0.0153	0.0153	0.0060	0.0060	0.0060
N ₂	mole %	77.10%	77.10%	77.10%	76.86%	76.86%	76.86%	77.58%	77.58%	77.58%
O ₂	mole %	20.74%	20.74%	20.74%	20.67%	20.67%	20.67%	20.87%	20.87%	20.87%
CO ₂	mole %	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
H ₂ O	mole %	1.20%	1.20%	1.20%	1.51%	1.51%	1.51%	0.60%	0.60%	0.60%
Ar	mole %	0.93%	0.93%	0.93%	0.93%	0.93%	0.93%	0.93%	0.93%	0.93%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Molecular Weight		28.84	28.84	28.84	28.80	28.80	28.80	28.90	28.90	28.90
N ₂	mass %	74.91%	74.91%	74.91%	74.76%	74.76%	74.76%	75.19%	75.19%	75.19%
O ₂	mass %	23.01%	23.01%	23.01%	22.97%	22.97%	22.97%	23.10%	23.10%	23.10%
CO ₂	mass %	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
H ₂ O	mass %	0.75%	0.75%	0.75%	0.94%	0.94%	0.94%	0.37%	0.37%	0.37%
Ar	mass %	1.29%	1.29%	1.29%	1.28%	1.28%	1.28%	1.29%	1.29%	1.29%
Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
CT Exhaust Temperature	deg. F	863.5	837.7	841.9	856.4	772.6	747.5	845.2	721.1	687.3
C _p N ₂	Btu/lb-deg. F	0.271	0.271	0.271	0.271	0.271	0.271	0.271	0.271	0.271
C _p O ₂	Btu/lb-deg. F	0.254	0.254	0.254	0.254	0.254	0.254	0.254	0.254	0.254
C _p CO ₂	Btu/lb-deg. F	0.281	0.281	0.281	0.281	0.281	0.281	0.281	0.281	0.281
C _p H ₂ O	Btu/lb-deg. F	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750
C _p Ar	Btu/lb-deg. F	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124
C _p Exhaust	Btu/lb-deg. F	0.317	0.298	0.295	0.314	0.299	0.295	0.305	0.293	0.289
C _p Tempering Air	Btu/lb-deg. F	0.240	0.240	0.240	0.240	0.240	0.240	0.240	0.240	0.240
Minimum Tempering Air Required	lb/hr	-	-	-	-	-	-	-	-	-
Minimum Tempering Air Required	cfm	-	-	-	-	-	-	-	-	-
Actual Tempering Air	cfm	-	-	-	-	-	-	-	-	-
Actual Tempering Air	lb/hr	-	-	-	-	-	-	-	-	-
Purge Air	cfm	6,815	6,815	6,815	6,815	6,815	6,815	6,815	6,815	6,815
Purge Air	lb/hr	28,635	28,635	28,635	30,656	30,656	30,656	32,302	32,302	32,302
Total Emissions Upstream of Catalyst (each CT)										
NO _x as NO ₂	lb/hr	41.5	25.1	16.7	43.0	25.5	16.4	44.6	26.1	16.4
CO	lb/hr	7.4	8.6	5.1	11.7	11.2	6.0	35.7	23.8	12.2
VOC, as CH ₄	lb/hr	1.3	0.8	0.5	1.4	0.8	0.5	2.3	1.6	0.8
PM10	lb/hr	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Portion of PM10 from Sulfur Particulates	lb/hr	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.0
Portion of PM10 from Soot/Ash	lb/hr	2.9	2.9	3.0	2.9	2.9	3.0	2.9	2.9	3.0
SO ₂ Converted to PM10 w/in CT & HRSG	lb/hr	0.05	0.03	0.02	0.05	0.03	0.02	0.05	0.03	0.02
Maximum SO ₂	lb/hr	1.0	0.6	0.4	1.0	0.6	0.4	1.0	0.6	0.4
Annual Average SO ₂	lb/hr	0.3	0.2	0.1	0.3	0.2	0.1	0.3	0.2	0.1
CO Catalyst Performance (each CT)										
Required CO Reduction	lb/hr	3.3	6.2	3.5	7.5	8.8	4.4	31.4	21.3	10.6
Required CO Reduction (mass basis)	%	45%	72%	68%	64%	78%	73%	88%	89%	87%
Required VOC Reduction	lb/hr	0.8	0.5	0.3	0.8	0.5	0.3	1.7	1.2	0.6
Required VOC Reduction (mass basis)	%	61%	61%	61%	61%	61%	61%	76%	79%	74%
PM10 Increase from Sulfur Particulates	lb/hr	1.5	0.9	0.6	1.6	0.9	0.6	1.6	1.0	0.6
SO ₂ Converted to PM10 w/in CO Catalyst	lb/hr	0.72	0.44	0.30	0.75	0.45	0.29	0.77	0.46	0.29
NOx Catalyst Performance (each CT)										
Required NO _x Reduction, as NO ₂	lb/hr	38.2	23.1	15.4	39.6	23.5	15.1	41.0	24.0	15.1
Required NO _x Reduction (mass basis)	%	92%	92%	92%	92%	92%	92%	92%	92%	92%
PM10 Increase from Sulfur Particulates	lb/hr	0.04	0.02	0.02	0.04	0.02	0.02	0.04	0.02	0.02
NH ₃ Slip	lb/hr	3.1	1.9	1.2	3.2	1.9	1.2	3.3	1.9	1.2
NH ₃ Reacted	lb/hr	14.8	9.0	6.0	15.4	9.1	5.9	16.0	9.3	5.9
Total NH ₃ Added	lb/hr	17.9	10.8	7.2	18.6	11.0	7.1	19.3	11.3	7.1
Stack Exhaust Analysis (each CT)										
N ₂	lb/hr	747,793	577,225	445,555	771,525	617,985	479,967	808,439	663,971	513,796
O ₂	lb/hr	153,770	131,217	105,870	158,478	142,783	116,951	167,177	155,657	127,169
CO ₂	lb/hr	53,530	32,549	21,913	55,349	33,236	21,571	57,215	34,133	21,708
H ₂ O	lb/hr	83,112	42,980	27,349	82,495	44,099	27,369	76,369	40,779	24,069
Ar	lb/hr	12,836	9,910	7,650	13,243	10,610	8,241	13,877	11,399	8,822
Total	lb/hr	1,051,040	793,881	608,337	1,081,091	848,712	654,099	1,123,077	905,940	695,564

Stanton 2x0

Combustion Turbine Operating Emissions and Support Data

		Hot Ambient Conditions			Average Ambient Conditions			Cold Ambient Conditions		
		Case 100	Case 101	Case 102	Case 103	Case 104	Case 105	Case 106	Case 107	Case 108
		Base	Mid	Min	Base	Mid	Min	Base	Mid	Min
N ₂	mass %	71.1%	72.7%	73.2%	71.4%	72.8%	73.4%	72.0%	73.3%	73.9%
O ₂	mass %	14.6%	16.5%	17.4%	14.7%	16.8%	17.9%	14.9%	17.2%	18.3%
CO ₂	mass %	5.1%	4.1%	3.6%	5.1%	3.9%	3.3%	5.1%	3.8%	3.1%
H ₂ O	mass %	7.9%	5.4%	4.5%	7.6%	5.2%	4.2%	6.8%	4.5%	3.5%
Ar	mass %	1.2%	1.2%	1.3%	1.2%	1.3%	1.3%	1.2%	1.3%	1.3%
Total	mass %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
N ₂	moles/hr	27,115	20,905	16,051	28,006	22,322	17,245	29,466	23,978	18,456
O ₂	moles/hr	4,886	4,164	3,342	5,041	4,520	3,682	5,339	4,926	4,003
CO ₂	moles/hr	1,240	753	504	1,283	767	495	1,332	787	498
H ₂ O	moles/hr	3,747	1,766	1,213	3,624	1,904	1,283	2,996	1,689	1,091
Ar	moles/hr	326	252	193	337	269	208	355	289	222
Total	moles/hr	37,314	27,840	21,303	38,292	29,781	22,912	39,488	31,669	24,270
N ₂	mole%	72.7%	75.1%	75.3%	73.1%	75.0%	75.3%	74.6%	75.7%	76.0%
O ₂	mole%	13.1%	15.0%	15.7%	13.2%	15.2%	16.1%	13.5%	15.6%	16.5%
CO ₂	mole%	3.3%	2.7%	2.4%	3.4%	2.6%	2.2%	3.4%	2.5%	2.1%
H ₂ O	mole%	10.0%	6.3%	5.7%	9.5%	6.4%	5.6%	7.6%	5.3%	4.5%
Ar	mole%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
Total	mole%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Molecular Weight		28.17	28.52	28.56	28.23	28.50	28.55	28.44	28.61	28.66
Stack Temperature	deg. F	847.7	816.2	813.4	839.1	751.9	721.2	826.9	701.1	662.2
Stack Temperature	deg. K	726.3	708.8	707.2	721.6	673.1	656.0	714.7	644.9	623.2
Stack Flow	cf/hr	35,718,000	26,008,000	19,857,000	36,414,000	26,419,000	19,811,000	37,197,000	26,916,000	19,936,000
Stack Velocity	ft/sec	87.2	63.5	48.5	88.9	64.5	48.4	90.8	65.7	48.7
Stack Velocity	m/sec	26.6	19.4	14.8	27.1	19.7	14.7	27.7	20.0	14.8
Calculated Stack Emissions (each CT)										
NO _x @ 15% O ₂	ppmvd	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
CO, @ 15% O ₂	ppmvd	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
VOC, as CH ₄ @ 15% O ₂	ppmvd	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
NH ₃ slip, @ 15% O ₂	ppmvd	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
NO _x as NO ₂	lb/hr	3.32	2.00	1.34	3.44	2.04	1.31	3.57	2.09	1.31
CO	lb/hr	4.04	2.44	1.63	4.19	2.48	1.59	4.34	2.54	1.60
VOC, as CH ₄	lb/hr	0.52	0.31	0.21	0.54	0.32	0.21	0.56	0.33	0.21
Total PM10 from Sulfur Particulates	lb/hr	1.60	0.97	0.65	1.66	0.99	0.64	1.71	1.02	0.65
Total PM10 from Sulfur Particulates	lb/hr	4.60	3.90	3.60	4.60	4.00	3.60	4.70	4.00	3.60
NH ₃	lb/hr	3.07	1.85	1.24	3.18	1.89	1.21	3.30	1.93	1.21
Maximum SO ₂	lb/hr	0.95	0.58	0.39	0.99	0.59	0.38	1.02	0.61	0.38
Annual Average SO ₂	lb/hr	0.32	0.19	0.13	0.33	0.20	0.13	0.34	0.20	0.13
Permitted Stack Emissions (each CT)										
NO _x @ 15% O ₂	ppmvd	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
CO, @ 15% O ₂	ppmvd	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
VOC, as CH ₄ @ 15% O ₂	ppmvd	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
NH ₃ Slip, @ 15% O ₂	ppmvd	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
NO _x as NO ₂	lb/hr	4.15	2.51	1.67	4.30	2.55	1.63	4.46	2.61	1.64
CO	lb/hr	4.04	2.44	1.63	4.19	2.48	1.59	4.34	2.54	1.60
VOC, as CH ₄	lb/hr	0.58	0.35	0.23	0.60	0.36	0.23	0.62	0.36	0.23
Maximum Total PM10	lb/hr	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Annual Average Total PM10	lb/hr	1.87	1.14	0.76	1.93	1.16	0.75	2.00	1.19	0.75
NH ₃	lb/hr	3.07	1.85	1.24	3.18	1.89	1.21	3.30	1.93	1.21
Maximum SO ₂	lb/hr	0.95	0.58	0.39	0.99	0.59	0.38	1.02	0.61	0.38
Annual Average SO ₂	lb/hr	0.32	0.19	0.13	0.33	0.20	0.13	0.34	0.20	0.13
NO _x as NO ₂	lb/MMBtu(HHV)	0.00916	0.00911	0.00904	0.00917	0.00908	0.00900	0.00921	0.00907	0.00898
CO	lb/MMBtu(HHV)	0.00892	0.00888	0.00881	0.00894	0.00885	0.00876	0.00897	0.00884	0.00875
VOC, as CH ₄	lb/MMBtu(HHV)	0.00128	0.00127	0.00126	0.00128	0.00127	0.00125	0.00128	0.00127	0.00125
Maximum Total PM10	lb/MMBtu(HHV)	0.00662	0.01092	0.01624	0.00640	0.01070	0.01652	0.00620	0.01042	0.01643
Annual Average Total PM10	lb/MMBtu(HHV)	0.00413	0.00413	0.00413	0.00413	0.00413	0.00413	0.00413	0.00413	0.00413
Maximum SO ₂	lb/MMBtu(HHV)	0.00210	0.00210	0.00210	0.00210	0.00210	0.00210	0.00210	0.00210	0.00210
Annual Average SO ₂	lb/MMBtu(HHV)	0.00070	0.00070	0.00070	0.00070	0.00070	0.00070	0.00070	0.00070	0.00070
CO ₂	lb/MMBtu(HHV)	118.15	118.42	118.61	118.15	118.49	118.75	118.16	118.55	118.85



Stanton 2x0

Startup & Shutdown Emissions Summary

	W Power Values	Base Load	Proposed Limits ¹
Startup for Short-Term Emissions and Permit Limits			
Start Duration, minutes	8.0	7.0	15.0
Start Fuel Consumption, MMBtu (HHV)	31.86	56.49	88.35
Total per Start (per turbine)			
NO _x , lbs	2.56	0.52	3.08
CO, lbs	1.29	0.51	1.79
VOC, lbs	0.35	0.07	0.42
PM10, lbs (maximum)	0.40	0.35	0.75
SO ₂ , lbs (maximum)	0.07	0.12	0.19
Startup for Montly and Annual Emissions Calculations			
Start Duration, minutes	8.0		
Start Fuel Consumption, MMBtu (HHV)	26.50		
Total per Start (per turbine)			
NO _x , lbs	1.85		
CO, lbs	0.87		
VOC, lbs	0.35		
PM10, lbs (annual average)	0.11		
SO ₂ , lbs (annual average)	0.02		
Shutdown for Short-Term Emissions and Permit Limits			
Shutdown Duration, minutes	10.0	-	10.0
Shutdown Fuel Consumption, MMBtu (HHV)	9.58	-	9.58
Total per Shutdown (per turbine)			
NO _x , lbs	1.00	-	1.00
CO, lbs	8.90	-	8.90
VOC, lbs	1.40	-	1.40
PM10, lbs (maximum)	0.50	-	0.50
SO ₂ , lbs (maximum)	0.02	-	0.02
Shutdown for Montly and Annual Emissions Calculations			
Shutdown Duration, minutes	10.0		
Shutdown Fuel Consumption, MMBtu (HHV)	9.58		
Total per Shutdown (per turbine)			
NO _x , lbs	1.00		
CO, lbs	8.90		
VOC, lbs	1.40		
PM10, lbs (annual average)	0.04		
SO ₂ , lbs (annual average)	0.01		

Notes

1. Proposed limits are based on the W Power short-term emissions values plus the difference in duration between the W Power duration and the proposed duration times the baseload emissions rates.

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN

GE Power & Water

Performance By:
Project Info:

Engine: **LM6000 PC-SPRINT w/ FIGV at -5 Degrees**
Deck Info: **G0125P_V2 - 8fk.scp**
Generator: **BDAX 7-290ERJT 60Hz, 12.47kV, 0.9PF (EffCurve#: 32381; CapCurve#: 32379)**
Fuel: **Gas Fuel #10-1, 19000 Btu/lb,LHV**

Date: **06/21/2016**
Time: **5:20:03 PM**
Version: **4.1.2**

* Multi-Engine Average Performance has been provided. Refer to XNENG.

Case #	100	101	102	103	104	105	106	107	108
Ambient Conditions									
Dry Bulb, °F	102.7	102.7	102.7	65.0	65.0	65.0	40.0	40.0	40.0
Wet Bulb, °F	69.1	69.0	69.0	59.3	59.3	59.3	36.4	36.4	36.4
RH, %	17.0	17.0	17.0	72.0	72.0	72.0	71.4	71.4	71.4
Altitude, ft	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
Ambient Pressure, psia	14.657	14.657	14.657	14.657	14.657	14.657	14.657	14.657	14.657
Engine Inlet									
Comp Inlet Temp, °F	69.1	102.7	102.7	59.3	65.0	65.0	40.0	40.0	40.0
RH, %	100.0	17.0	17.0	100.0	72.0	72.0	71.4	71.4	71.4
Conditioning	EVAP	NONE	NONE	EVAP	NONE	NONE	NONE	NONE	NONE
Tons(Chilling) or kBtu/hr(Heating)	0	0	0	0	0	0	0	0	0
Pressure Losses									
Inlet Loss, inH2O	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
Volute Loss, inH2O	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Exhaust Loss, inH2O	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
Partload %	100	50	21	100	50	21	100	50	20
kW, Gen Terms	47252	23649	10148	49058	24532	10074	51049	25530	10074
Est. Btu/kW-hr, LHV	8651	10488	16425	8616	10318	16270	8559	10178	16358
XNENG	7 Eng Avg 7 Eng Avg 7 Eng Avg 7 Eng Avg 7 Eng Avg 7 Eng Avg 7 Eng Avg 7 Eng Avg								
Fuel Flow									
MMBtu/hr, LHV	408.8	248.0	166.7	422.7	253.1	163.9	436.9	259.8	164.8
lb/hr	21514	13055	8773	22247	13323	8627	22997	13676	8673
NOx Control									
	Water	Water	Water	Water	Water	Water	Water	Water	Water
Water Injection									
lb/hr	16699	11647	5712	18324	10217	4421	23557	10725	4548
Temperature, °F	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SPRINT									
	LPC	OFF	OFF	LPC	OFF	OFF	HPC	OFF	OFF
lb/hr	9323	0	0	9571	0	0	3792	0	0
Control Parameters									
HP Speed, RPM	10540	10143	9659	10503	9854	9378	10479	9683	9194
LP Speed, RPM	3600	3600	3600	3600	3600	3600	3600	3600	3600
PS3 - CDP, psia	439.1	312.7	228.4	450.7	327.7	238.3	466.2	344.1	248.2
P3, psia	443.74	316.55	230.46	455.41	331.84	240.74	471.23	348.74	250.99
T3CRF - CDT, °F	986.97	993.49	880.82	980.42	913.72	805.60	994.21	870.71	766.37
T48IN, °R	2046	1895	1774	2046	1821	1663	2045	1765	1597
T48IN, °F	1587	1436	1314	1587	1361	1204	1586	1305	1137
Exhaust Parameters									
Temperature, °F	863.5	837.7	841.9	856.4	772.6	747.5	845.2	721.1	687.3
lb/sec	284.0	212.6	161.0	291.8	227.2	173.2	303.0	242.7	184.2
lb/hr	1022406	765246	579702	1050435	818056	623443	1090776	873638	663262
Energy, Btu/s- Ref 0 °R	98062	70416	53133	99940	71132	52612	102137	72192	52715
Energy, Btu/s- Ref T2 °F	60031	40677	30753	61682	41537	30219	64151	42265	30162
Cp, Btu/lb-R	0.2797	0.2724	0.2702	0.2788	0.2694	0.2660	0.2763	0.2659	0.2622
Emissions (ESTIMATED, NOT FOR GUARANTEE)									
NOx ppmvd Ref 15% O2	25	25	25	25	25	25	25	25	25
NOx as NO2, lb/hr	41	25	17	43	26	16	44	26	17
CO ppmvd Ref 15% O2	7	14	13	11	18	15	33	37	31
CO, lb/hr	7.30	8.60	5.16	11.65	11.22	6.01	35.39	23.83	12.35
CO2, lb/hr	54369.64	33071.90	22257.99	56213.18	33765.18	21910.94	58089.32	34657.96	22037.88
HC ppmvd Ref 15% O2	2	2	2	2	2	2	4	4	3
HC, lb/hr	1.29	0.78	0.53	1.33	0.80	0.52	2.25	1.53	0.78
SOX as SO2, lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Greenhouse Gas Emissions Calculator

Table 5.1A-2

SF6-Direct Fugitive Emissions Electrical Equipment Used by Utilities

Emissions Analysis Period:

Annual

System ID:

SERC

of SF6 breakers:

1

SF6 capacity of each unit, lbs:

45

Total capacity of system identified, lbs:

45

=

20.41

kg

Calculated losses of SF6 (lbs) for the device and reporting period:

0.23

lbs/yr

0.10

kg/yr

GWP Factor:

22800

Total Annual Emissions of SF6:

2.33

CO2e metric tons

2.57

CO2e short tons

* estimated loss rate from circuit breakers is less than 0.5% wt. per year.

Ref: SERC Project Team, 2016

Ref: GWP Factor - 40 CFR 98, Subpart A, Table A-1, updated 1/1/14.

Print this sheet subsequent to data entry and data QA.

Table 5.1A-3 Natural Gas Analysis

	Fuel Gas Composition (mole %)	Mole % x Molecular Weight	Fuel Gas Composition (mass %)	Molecular Weight	Density (lbs/scf)	Specific Gravity	Heat of Combustion		Lb/lb Fuel										
							Gross	Net	Required for Combustion					Exhaust Products					
									N2	O2	CO2	Ar	Dry Air	N2	CO2	SO2	H2O	Ar	
Methane	CH ₄	93.358%	14.977	87.5%	16.043	0.0422	0.5558	23,879	21,520	11.35	3.49	0.01	0.20	15.05	11.35	2.41	0.00	1.96	0.20
Ethane	C ₂ H ₆	3.775%	1.135	6.6%	30.070	0.0792	1.0418	22,320	20,432	0.80	0.25	0.00	0.01	1.06	0.80	0.19	0.00	0.12	0.01
Propane	C ₃ H ₈	0.218%	0.096	0.6%	44.097	0.1161	1.5277	21,661	19,944	0.07	0.02	0.00	0.00	0.09	0.07	0.02	0.00	0.01	0.00
n-Butane	C ₄ H ₁₀	0.021%	0.012	0.1%	58.124	0.1530	2.0137	21,308	19,680	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Isobutane	C ₄ H ₁₀	0.026%	0.015	0.1%	58.124	0.1530	2.0137	21,257	19,629	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
n-Pentane	C ₅ H ₁₂	0.014%	0.010	0.1%	72.151	0.1900	2.4997	21,091	19,517	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Isopentane	C ₅ H ₁₂	0.009%	0.006	0.0%	72.151	0.1900	2.4997	21,052	19,478	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Neopentane	C ₅ H ₁₂	0.000%	0.000	0.0%	72.151	0.1900	2.4997	20,970	19,396	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n-Hexane	C ₆ H ₁₄	0.004%	0.003	0.0%	86.178	0.2269	2.9856	20,940	19,403	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethylene	C ₂ H ₄	0.000%	0.000	0.0%	28.054	0.0739	0.9719	21,644	20,295	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propylene	C ₃ H ₆	0.000%	0.000	0.0%	42.081	0.1108	1.4579	21,041	19,691	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n-Butene	C ₄ H ₈	0.000%	0.000	0.0%	56.108	0.1477	1.9439	20,840	19,496	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Isobutene	C ₄ H ₈	0.000%	0.000	0.0%	56.108	0.1477	1.9439	20,730	19,382	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n-Pentene	C ₅ H ₁₀	0.000%	0.000	0.0%	70.135	0.1847	2.4298	20,712	19,363	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	C ₆ H ₆	0.000%	0.000	0.0%	78.115	0.2057	2.7063	18,210	17,480	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Toluene	C ₇ H ₈	0.000%	0.000	0.0%	92.142	0.2426	3.1922	18,440	17,620	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Xylene	C ₈ H ₁₀	0.000%	0.000	0.0%	106.169	0.2795	3.6782	18,650	17,760	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acetylene	C ₂ H ₂	0.000%	0.000	0.0%	26.038	0.0686	0.9021	21,500	20,776	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Napthalene	C ₁₀ H ₈	0.000%	0.000	0.0%	128.175	0.3375	4.4406	17,298	16,708	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Methyl alcohol	CH ₃ OH	0.000%	0.000	0.0%	32.042	0.0844	1.1101	10,259	9,078	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethyl alcohol	C ₂ H ₅ OH	0.000%	0.000	0.0%	46.070	0.1213	1.5961	13,161	11,929	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ammonia	NH ₃	0.000%	0.000	0.0%	17.031	0.0448	0.5900	9,668	8,001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrogen	H ₂	0.000%	0.000	0.0%	2.016	0.0053	0.0698	61,100	51,623	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nitrogen	N ₂	1.501%	0.420	2.5%	28.013	0.0738	0.9712	0	0	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Oxygen	O ₂	0.191%	0.061	0.4%	31.999	0.0843	1.1093	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbon Dioxide	CO ₂	0.884%	0.389	2.3%	44.010	0.1159	1.5247	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Total		100.0%		100.0%	17.127	0.0451	0.5938	22,542	20,340	12.26	3.76	0.01	0.21	16.24	12.28	2.65	0.00	2.10	0.21
Sulfur Compounds										N2	O2	CO2	Ar	Dry Air	N2	CO2	SO2	H2O	Ar
Maximum Sulfur	S	0.75 grains/100scf	0.00237%	32.060	N/A	N/A	3,983	3,983	7.7E-05	2.4E-05	4.7E-08	1.3E-06	1.0E-04	7.7E-05	4.7E-08	4.7E-05	0.0E+00	1.3E-06	
Annual Average Sulfur	S	0.25 grains/100scf	0.00079%	32.060	N/A	N/A	3,983	3,983	2.6E-05	7.9E-06	1.6E-08	4.4E-07	3.4E-05	2.6E-05	1.6E-08	1.6E-05	0.0E+00	4.4E-07	
Hydrogen Sulfide	H ₂ S	0 ppmv	0.000%	34.076	0.0897	1.1806	7,100	6,545	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Maximum Total			0.00237%						7.7E-05	2.4E-05	4.7E-08	1.3E-06	1.0E-04	7.7E-05	4.7E-08	4.7E-05	0.0E+00	1.3E-06	
Annual Average Total			0.00079%						2.6E-05	7.9E-06	1.6E-08	4.4E-07	3.4E-05	2.6E-05	1.6E-08	1.6E-05	0.0E+00	4.4E-07	

Btu/scf
Gross Net
1,017.2 917.8

**Table 5.1A-4
Calculation of Hazardous and Toxic Pollutant Emissions from Combustion Turbines**

of Units: 2
Fuel HHV: 1017 btu/scf

Compound	EF Src	Single Turbine					All Turbines				Federal HAP
		Uncontrolled Emission Factor, lb/MMscf	CO Catalyst Control Multiplier	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Annual Emissions, lb/yr	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Annual Emissions, lb/yr	Annual Emissions, tons/yr	
Acetaldehyde	EPA	4.08E-02	2.00E-01	3.89E-03	9.32E-02	4.04E+00	7.77E-03	1.86E-01	8.09E+00	4.04E-03	Yes
Acrolein	EPA	6.50E-03	2.00E-01	6.19E-04	1.49E-02	6.44E-01	1.24E-03	2.97E-02	1.29E+00	6.44E-04	Yes
Ammonia	MFG	(3)		3.30E+00	7.92E+01	3.55E+03	6.60E+00	1.58E+02	7.10E+03	3.55E+00	No
Benzene	EPA	1.23E-02	2.00E-01	1.17E-03	2.80E-02	1.21E+00	2.33E-03	5.60E-02	2.43E+00	1.21E-03	Yes
1,3-Butadiene	EPA	4.39E-04	2.00E-01	4.18E-05	1.00E-03	4.35E-02	8.36E-05	2.01E-03	8.70E-02	4.35E-05	Yes
Ethylbenzene	EPA	3.27E-02	2.00E-01	3.11E-03	7.47E-02	3.24E+00	6.23E-03	1.49E-01	6.48E+00	3.24E-03	Yes
Formaldehyde	EPA	7.25E-01	5.00E-01	1.73E-01	4.14E+00	1.80E+02	3.45E-01	8.28E+00	3.59E+02	1.80E-01	Yes
Hexane	CATEF	2.59E-01	2.00E-01	2.47E-02	5.92E-01	2.57E+01	4.93E-02	1.18E+00	5.14E+01	2.57E-02	Yes
Naphthalene	EPA	1.33E-03	2.00E-01	1.27E-04	3.04E-03	1.32E-01	2.53E-04	6.08E-03	2.64E-01	1.32E-04	Yes
PAHs (BaP)	CATEF	2.41E-04	2.00E-01	2.29E-05	5.51E-04	2.39E-02	4.59E-05	1.10E-03	4.78E-02	2.39E-05	Yes
Propylene	CATEF	7.71E-01	2.00E-01	7.34E-02	1.76E+00	7.64E+01	1.47E-01	3.52E+00	1.53E+02	7.64E-02	No
Propylene oxide	EPA	2.96E-02	2.00E-01	2.82E-03	6.76E-02	2.93E+00	5.64E-03	1.35E-01	5.87E+00	2.93E-03	Yes
Toluene	EPA	1.33E-01	2.00E-01	1.26E-02	3.03E-01	1.32E+01	2.53E-02	6.07E-01	2.63E+01	1.32E-02	Yes
Xylene	EPA	6.53E-02	2.00E-01	6.22E-03	1.49E-01	6.48E+00	1.24E-02	2.99E-01	1.30E+01	6.48E-03	Yes
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
*		0.00E+00	5.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

Federal HAPs, tons/yr: 2.37E-01

Notes:

(1) Provided by CATEF database and EPA AP-42, Section 3.1, 2000.

(2) Based on maximum hourly turbine fuel use of:

4.7611E-01 mmscf/hr

Based on a maximum daily turbine fuel use of:

1.1427E+01 mmscf/day

Based on maximum annual turbine fuel use of:

4.9568E+02 mmscf/yr

(3) Values from ammonia slip calculations by GE Case 106 (cold day)

(4) Fuel use values include HRSG duct burners (Yes or No)

No

CO Catalyst Control Efficiencies

	Control Frac.	Multiplier
Organic HAPs	0.80	0.20
Inorganic HAPs	0.50	0.50

Each Turbine

24

Max hrs/day

Each Turbine

1076

Max Hrs/yr



Stanton 2x0
Commissioning Emissions

Table 5.1A-5

Step No.	Description of Activity	Maximum Duration (hrs)	Average Emissions Rate (per Turbine) (lbs/hr)				Notes
			NO _x	CO	VOC	PM10	
1	First fire and full speed, no load (not synchronized), no generator excitation	8	32.5	11.3	8.96	3.0	SCR and CO catalyst not installed, water injection not enabled
2	First fire and full speed, no load (not synchronized), generator excitation checks	6	32.5	11.3	8.96	3.0	SCR and CO catalyst not installed, water injection not enabled
3	First synchronization	6	32.5	11.3	8.96	3.0	SCR and CO catalyst not installed, water injection not enabled
4	Synchronization and ramp to full load, tuning water, ammonia (rough), and AVR (as needed), gas compressor tuning	12	32.5	11.3	8.96	3.0	SCR and CO catalyst not installed, water injection to be enabled and tuned
5	Full load operation with water injection and SPRINT in service for exhaust duct curing	8	32.5	11.3	8.96	3.0	SCR and CO catalyst not installed, water injection operable
6	Full load operation with water injection and SPRINT in service and SCR/ammonia tuning	60	16.3	3.1	0.90	3.0	SCR and CO catalyst installed, testing of exhaust flow maldistribution and tuning of ammonia flows
1-5	Subtotal Prior to Installation of Catalysts, hrs or lbs	40	1,301	450	358	120	
6	Subtotal After Installation of Catalysts, hrs or lbs	60	976	185	54	180	
1-6	Total Commissioning Period, hrs or lbs	100	2,277	635	412	300	



Stanton 2x0

Short-Term Emissions During Commissioning

Table 5.1A-5

Maximum Hour		Notes
Combustion Turbines (each unit)		
NO _x , lbs as NO ₂	42.81	pre-catalyst installation
CO, lbs	55.30	pre-catalyst installation
VOC, lbs as CH ₄	8.96	pre-catalyst installation
PM10, lbs	3.00	
SO ₂ , lbs	1.02	maximum sulfur content
Total		
NO _x , lbs as NO ₂	85.62	2 CT's pre-catalyst installation
CO, lbs	110.60	2 CT's pre-catalyst installation
VOC, lbs as CH ₄	17.92	2 CT's pre-catalyst installation
PM10, lbs	6.00	2 CT's
SO ₂ , lbs	2.04	2 CT's, maximum sulfur content
Maximum 3-Hours		Notes
Combustion Turbines (each unit)		
SO ₂ , lbs	3.06	maximum sulfur content
Total		
SO ₂ , lbs	6.11	2 CT's, maximum sulfur content
Maximum 8-Hours		Notes
Combustion Turbines (each unit)		
CO, lbs	442.40	pre-catalyst installation
Total		
CO, lbs	884.80	2 CT's pre-catalyst installation
Maximum 24-Hours		Notes
Combustion Turbines (each unit)		
NO _x , lbs as NO ₂	1,027.44	pre-catalyst installation
CO, lbs	1,327.20	pre-catalyst installation
VOC, lbs as CH ₄	215.04	pre-catalyst installation
PM10, lbs	72.00	
SO ₂ , lbs	24.46	maximum sulfur content
Total		
NO _x , lbs as NO ₂	2,054.88	2 CT's pre-catalyst installation
CO, lbs	2,654.40	2 CT's pre-catalyst installation
VOC, lbs as CH ₄	430.08	2 CT's pre-catalyst installation
PM10, lbs	144.00	2 CT's
SO ₂ , lbs	48.91	2 CT's, maximum sulfur content