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CED
Henrietta
69381
Simple Cycle Plant Emissions Estimate, Revision 1

Case Number	1	2	3	4	5	6	7
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	60%	100%	60%	100%	60%	100%
CTG Inlet Air Conditioning In Operation?	No	No	No	No	No	No	Evap. Cooler
Ambient Temperature, F	15	15	25	25	36	36	59
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Ambient Temperature, F	15.0	15.0	25.0	25.0	36.0	36.0	59.0
Ambient Relative Humidity, %	92.0	92.0	60.0	60.0	75.0	75.0	60.0
Atmospheric Pressure, psia	14.569	14.569	14.569	14.569	14.569	14.569	14.569
CTG Inlet Air Conditioning Effectiveness, %	0	0	0	0	0	0	85
CTG Compressor Inlet Dry Bulb Temperature, F	15.0	15.0	25.0	25.0	36.0	36.0	52.6
CTG Compr. Inlet Relative Humidity, %	92.1	92.1	60.3	60.3	75.2	75.2	92.9
Inlet Loss, in. H2O	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Exhaust Loss, in. H2O	6.0	6.0	6.0	6.0	6.0	6.0	6.0
CTG Performance Reference	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY
CTG Load Level (percent of Base Load)	100%	60%	100%	60%	100%	60%	100%
Gross CTG Output, kW	50,448	30,136	50,804	30,492	50,345	30,074	47,447
Gross CTG Heat Rate, Btu/kWh (LHV)	8,317	9,497	8,362	9,463	8,440	9,548	8,659
Gross CTG Heat Rate, Btu/kWh (HHV)	9,204	10,510	9,254	10,472	9,340	10,566	9,583
CTG Heat Input, MBtu/h (LHV)	419.6	286.2	424.8	288.6	424.9	287.2	410.8
CTG Heat Input, MBtu/h (HHV)	464.3	316.7	470.1	319.3	470.2	317.8	454.7
CTG Water Injection Flow, lb/h	22,574	11,901	23,860	12,480	24,084	12,385	21,793
CTG Steam Injection Flow, lb/h	0	0	0	0	0	0	0
Injection Fluid/Fuel Ratio	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CTG Exhaust Flow, lb/h	1,130,760	947,880	1,110,240	936,720	1,082,880	914,400	1,041,480
CTG Exhaust Temperature, F	764	682	793	702	819	722	848
Total CTG Fuel Flow, lb/h	22,100	15,080	22,380	15,200	22,390	15,130	21,640
CTG Fuel Temperature, F	76	76	76	76	76	76	76
CTG Fuel LHV, Btu/lb	18,981	18,981	18,981	18,981	18,981	18,981	18,981
CTG Fuel HHV, Btu/lb	21,006	21,006	21,006	21,006	21,006	21,006	21,006
HHV/LHV Ratio	1.1067	1.1067	1.1067	1.1067	1.1067	1.1067	1.1067
CTG Fuel Composition (Ultimate Analysis by Weight)							
Ar	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C	68.44%	68.44%	68.44%	68.44%	68.44%	68.44%	68.44%
H2	21.38%	21.38%	21.38%	21.38%	21.38%	21.38%	21.38%
N2	8.80%	8.80%	8.80%	8.80%	8.80%	8.80%	8.80%
O2	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%
S	0.00072%	0.00072%	0.00072%	0.00072%	0.00072%	0.00072%	0.00072%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25

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Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	60%	100%	60%	100%	60%	100%
CTG Inlet Air Conditioning In Operation?	No	No	No	No	No	No	Evap. Cooler
Ambient Temperature, F	15	15	25	25	36	36	59
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combustion Turbine Exhaust Emissions							
CTG Exhaust Analysis (Volume Basis - Wet)							
Ar	0.92%	0.93%	0.91%	0.93%	0.91%	0.93%	0.90%
CO2	3.15%	2.58%	3.24%	2.63%	3.32%	2.68%	3.33%
H2O	9.22%	7.02%	9.65%	7.25%	10.14%	7.62%	10.62%
N2	73.14%	74.44%	72.87%	74.30%	72.54%	74.05%	72.18%
O2	13.58%	15.03%	13.32%	14.89%	13.08%	14.73%	12.97%
SO2	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
NOx, ppmvd @15% O2	25.00	25.00	25.00	25.00	25.00	25.00	25.00
NOx, ppmvd	25.18	20.15	26.06	20.58	26.83	21.05	27.06
NOx, ppmvw (wet - uncorrected exhaust gas)	22.86	18.73	23.54	19.09	24.11	19.44	24.18
NOx, lb/h as NO2	43.1	29.7	43.6	30.0	43.7	29.8	42.2
NOx, lb/MBtu (LHV)	0.1027	0.1039	0.1027	0.1038	0.1027	0.1039	0.1028
NOx, lb/MBtu (HHV)	0.0928	0.0939	0.0928	0.0938	0.0928	0.0938	0.0929
CO, ppmvd @ 15% O2	60.00	56.00	52.00	50.00	41.99	41.00	27.00
CO, ppmvd	60.43	45.13	54.20	41.17	45.07	34.52	29.22
CO, ppmvw (wet - uncorrected exhaust gas)	54.86	41.96	48.97	38.18	40.50	31.89	26.12
CO, lb/h	62.5	40.2	55.0	36.3	44.6	29.8	28.1
CO, lb/MBtu (LHV)	0.1490	0.1404	0.1294	0.1256	0.1050	0.1037	0.0684
CO, lb/MBtu (HHV)	0.1346	0.1268	0.1170	0.1135	0.0949	0.0937	0.0618
NOTE: SO2 estimate does not include the effects of SO2 oxidation							
SO2, ppmvd @ 15% O2 (with no SO2 oxidation)	0.14	0.14	0.14	0.14	0.14	0.14	0.14
SO2, ppmvd (with no SO2 oxidation)	0.14	0.11	0.14	0.11	0.15	0.11	0.15
SO2, ppmvw (with no SO2 oxidation)(wet - uncorrected exhaust gas)	0.12	0.10	0.13	0.10	0.13	0.11	0.13
SO2, lb/h (with no SO2 oxidation)	0.32	0.22	0.32	0.22	0.32	0.22	0.31
SO2, lb/MBtu (LHV) (with no SO2 oxidation)	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
SO2, lb/MBtu (HHV) (with no SO2 oxidation)	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007

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Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	60%	100%	60%	100%	60%	100%
CTG Inlet Air Conditioning In Operation?	No	No	No	No	No	No	Evap. Cooler
Ambient Temperature, F	15	15	25	25	36	36	59
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combustion Turbine Exhaust Emissions - continued							
UHC, ppmvd @ 15% O2	10.00	9.00	8.00	7.00	5.00	5.00	3.00
UHC, ppmvd	10.07	7.25	8.34	5.76	5.37	4.21	3.25
UHC, ppmvw (wet - uncorrected exhaust gas)	9.14	6.74	7.53	5.35	4.82	3.89	2.90
UHC, lb/h as CH4	6.4	4.1	5.3	3.3	3.5	2.5	2.2
UHC, lb/MBtu as CH4 (LHV)	0.0152	0.0143	0.0124	0.0115	0.0082	0.0087	0.0054
UHC, lb/MBtu as CH4 (HHV)	0.0137	0.0130	0.0112	0.0104	0.0074	0.0079	0.0049
VOC percentage of UHC	20%	20%	20%	20%	20%	20%	20%
VOC, ppmvd @ 15% O2	2.0	1.8	1.6	1.4	1.0	1.0	0.6
VOC, ppmvd	2.01	1.45	1.67	1.15	1.07	0.84	0.65
VOC, ppmvw (wet - uncorrected exhaust flow)	1.83	1.35	1.51	1.07	0.96	0.78	0.58
VOC, lb/h as CH4	1.2	0.7	1.0	0.6	0.6	0.4	0.3
VOC, lb/MBtu as CH4 (LHV)	0.0030	0.0029	0.0025	0.0023	0.0016	0.0017	0.0011
VOC, lb/MBtu as CH4 (HHV)	0.0027	0.0026	0.0022	0.0021	0.0015	0.0016	0.0010
Particulates, lb/h (front half catch only)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Particulates, lb/h (front and back half catch)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Particulates, lb/MBtu (LHV) (front half catch only)	0.0036	0.0052	0.0035	0.0052	0.0035	0.0052	0.0037
Particulates, lb/MBtu (HHV) (front half catch only)	0.0032	0.0047	0.0032	0.0047	0.0032	0.0047	0.0033
PM10, lb/h (front half catch only)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
PM10, lb/h (front and back half catch)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
PM10, lb/MBtu (LHV) (front and back half catch)	0.0072	0.0105	0.0071	0.0104	0.0071	0.0104	0.0073
PM10, lb/MBtu (HHV) (front and back half catch)	0.0065	0.0095	0.0064	0.0094	0.0064	0.0094	0.0066
CTG Wet (Total) Exhaust Gas Analysis							
Molecular Wt, lb/mol	28.25	28.44	28.21	28.42	28.16	28.38	28.11
Gas Constant, ft-lbf/lbm-R	54.700	54.330	54.770	54.370	54.860	54.440	54.960
Specific Volume, ft^3/lb	31.43	29.13	32.22	29.66	32.95	30.21	33.76
Exhaust Gas Flow, acfm	592,330	460,196	596,199	463,052	594,682	460,400	586,006
Specific Volume, scf/lb	13.43	13.34	13.45	13.35	13.47	13.37	13.50
Exhaust Gas Flow, scfm	253,102	210,745	248,879	208,420	243,107	203,759	234,333

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Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	60%	100%	60%	100%	60%	100%
CTG Inlet Air Conditioning In Operation?	No	No	No	No	No	No	Evap. Cooler
Ambient Temperature, F	15	15	25	25	36	36	59
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Stack Emissions							
NOTE: Exhaust Analysis does not include the effects of post combustion control							
Stack Exhaust Analysis (Volume Basis - Wet)							
Ar	0.92%	0.93%	0.91%	0.93%	0.91%	0.93%	0.90%
CO2	3.15%	2.58%	3.24%	2.63%	3.32%	2.68%	3.33%
H2O	9.22%	7.02%	9.65%	7.25%	10.14%	7.62%	10.62%
N2	73.14%	74.44%	72.87%	74.30%	72.54%	74.05%	72.18%
O2	13.58%	15.03%	13.32%	14.89%	13.08%	14.73%	12.97%
SO2	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Stack Emissions							
NOx, ppmvd @15% O2 w/o SCR (does not account for added margin	25.00	25.00	25.00	25.00	25.00	25.00	25.00
NOx, ppmvd w/o SCR	25.18	20.15	26.06	20.58	26.83	21.05	27.06
NOx, ppmvw w/o SCR	22.86	18.73	23.54	19.09	24.11	19.44	24.18
NOx, lb/h as NO2 w/o SCR (includes correction adder)	43.10	29.73	43.63	29.95	43.65	29.82	42.22
NOx, lb/MBtu (LHV) as NO2 w/o SCR	0.1027	0.1039	0.1027	0.1038	0.1027	0.1039	0.1028
NOx, lb/MBtu (HHV) as NO2 w/o SCR	0.0928	0.0939	0.0928	0.0938	0.0928	0.0938	0.0929
NOx, ppmvd @15% O2 w/ SCR	3.60	3.60	3.60	3.60	3.60	3.60	3.60
NOx, ppmvd w SCR	3.63	2.90	3.75	2.96	3.86	3.03	3.90
NOx, ppmvw w SCR	3.29	2.70	3.39	2.75	3.47	2.80	3.48
NOx, lb/h as NO2 w/ SCR (includes NOx margin applied to CTG)	6.21	4.28	6.28	4.31	6.29	4.29	6.08
NOx, lb/MBtu (LHV) as NO w SCR	0.0148	0.0150	0.0148	0.0149	0.0148	0.0150	0.0148
NOx, lb/MBtu (HHV) as NO2 w SCR	0.0134	0.0135	0.0134	0.0135	0.0134	0.0135	0.0134
SCR NH3 slip, ppmvd @15% O2	10.00	10.00	10.00	10.00	10.00	10.00	10.00
SCR NH3 slip, lb/h	6.23	4.25	6.31	4.29	6.32	4.27	6.10
CO, ppmvd @ 15% O2 w/o Catalyst	60.00	56.00	52.00	50.00	41.99	41.00	27.00
CO, ppmvd w/o Catalyst	60.43	45.13	54.20	41.17	45.07	34.52	29.22
CO, ppmvw w/o Catalyst	54.86	41.96	48.97	38.18	40.50	31.89	26.12
CO, lb/h w/o Catalyst (includes CO correction as applied to CTG and margin)	62.51	40.18	54.98	36.25	44.62	29.78	28.10
CO, lb/MBtu (LHV) w/o SCR	0.1490	0.1404	0.1294	0.1256	0.1050	0.1037	0.0684
CO, lb/MBtu (HHV) w/o SCR	0.1346	0.1268	0.1170	0.1135	0.0949	0.0937	0.0618
CO Reduction % w/ Catalyst	90%	90%	90%	90%	90%	90%	90%
CO, ppmvd @ 15% O2 w/ Catalyst	6.00	5.60	5.20	5.00	4.20	4.10	2.70
CO, ppmvd w/ Catalyst	6.04	4.51	5.42	4.12	4.51	3.45	2.92
CO, ppmvw w/ Catalyst	5.49	4.20	4.90	3.82	4.05	3.19	2.61
CO, lb/h w/ Catalyst (includes CO margin applied to CTG)	6.25	4.02	5.50	3.63	4.46	2.98	2.81
CO, lb/MBtu (LHV) w SCR	0.0149	0.0140	0.0129	0.0126	0.0105	0.0104	0.0068
CO, lb/MBtu (HHV) w SCR	0.0135	0.0127	0.0117	0.0114	0.0095	0.0094	0.0062
SO2, ppmvd@15% O2 w/o scrubber (with no SO2 oxidation)	0.136	0.136	0.136	0.136	0.136	0.136	0.136
SO2, ppmvd w/o scrubber (with no SO2 oxidation)	0.14	0.11	0.14	0.11	0.15	0.11	0.15

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Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	60%	100%	60%	100%	60%	100%
CTG Inlet Air Conditioning In Operation?	No	No	No	No	No	No	Evap. Cooler
Ambient Temperature, F	15	15	25	25	36	36	59
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
SO2, ppmvw w/o scrubber (with no SO2 oxidation)	0.12	0.10	0.13	0.10	0.13	0.11	0.13
SO2, lb/h w/o scrubber (with no SO2 oxidation)	0.32	0.22	0.32	0.22	0.32	0.22	0.31
SO2, lb/MBtu (LHV) w/o scrubber	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
SO2, lb/MBtu (HHV) w/o scrubber	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007

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Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	60%	100%	60%	100%	60%	100%
CTG Inlet Air Conditioning In Operation?	No	No	No	No	No	No	Evap. Cooler
Ambient Temperature, F	15	15	25	25	36	36	59
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Stack Emissions - continued							
NOTE: UHC calculations do NOT include the effect of any oxidation in the CO catalyst.							
UHC, ppmvd @ 15% O2	10.00	9.00	8.00	7.00	5.00	5.00	3.00
UHC, ppmvd	10.07	7.25	8.34	5.76	5.37	4.21	3.25
UHC, ppmvw	9.14	6.74	7.53	5.35	4.82	3.89	2.90
UHC, lb/h as CH4	6.37	4.11	5.26	3.33	3.47	2.51	2.22
UHC, lb/MBtu (LHV)	0.0152	0.0143	0.0124	0.0115	0.0082	0.0087	0.0054
UHC, lb/MBtu (HHV)	0.0137	0.0130	0.0112	0.0104	0.0074	0.0079	0.0049
VOC, ppmvd @ 15% O2 w/o Catalyst	2.00	1.80	1.60	1.40	1.00	1.00	0.60
VOC, ppmvd w/o Calatyst	2.01	1.45	1.67	1.15	1.07	0.84	0.65
VOC, ppmvw w/o Catalyst	1.83	1.35	1.51	1.07	0.96	0.78	0.58
VOC, lb/h as CH4 w/o Catalyst (includes correction adder)	1.17	0.72	0.95	0.57	0.59	0.40	0.35
VOC, lb/MBtu (LHV) w/o CO catalyst	0.0028	0.0025	0.0022	0.0020	0.0014	0.0014	0.0008
VOC, lb/MBtu (HHV) w/o CO catalyst	0.0025	0.0023	0.0020	0.0018	0.0013	0.0013	0.0008
VOC Reduction % w/ Catalyst	0%	0%	0%	0%	0%	0%	0%
VOC, ppmvd @ 15% O2 w/ Catalyst	2.00	1.80	1.60	1.40	1.00	1.00	0.60
VOC, ppmvd w/ Calatyst	2.01	1.45	1.67	1.15	1.07	0.84	0.65
VOC, ppmvw w/ Catalyst	1.83	1.35	1.51	1.07	0.96	0.78	0.58
VOC, lb/h as CH4 w/ Catalyst (includes VOC correction as applied to CTG)	1.17	0.72	0.95	0.57	0.59	0.40	0.35
VOC, lb/MBtu (LHV) w CO catalyst	0.0028	0.0025	0.0022	0.0020	0.0014	0.0014	0.0008
VOC, lb/MBtu (HHV) w CO catalyst	0.0025	0.0023	0.0020	0.0018	0.0013	0.0013	0.0008
Particulate without the effect of SO2 oxidation and SCR catalysts							
Particulates, lb/h (front half catch only)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Particulates, lb/MBtu (front half catch only)	0.0036	0.0052	0.0035	0.0052	0.0035	0.0052	0.0037
Particulates, lb/h (front and back half catch)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Particulates, lb/MBtu (front and back half catch)	0.0072	0.0105	0.0071	0.0104	0.0071	0.0104	0.0073
PM10, lb/h (front half catch only)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
PM10, lb/MBtu (front half catch only)	0.0036	0.0052	0.0035	0.0052	0.0035	0.0052	0.0037
PM10, lb/h (front and back half catch)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
PM10, lb/MBtu (front and back half catch)	0.0072	0.0105	0.0071	0.0104	0.0071	0.0104	0.0073
Particulate including the effect of SO2 oxidation and SCR catalysts [includes (NH4)2-(SO4)]							
Particulates, lb/h (front half catch only)	1.8	1.7	1.8	1.7	1.8	1.7	1.8
Particulates, lb/MBtu(front half catch only)	0.0042	0.0059	0.0042	0.0058	0.0042	0.0058	0.0043
Particulates, lb/h (front and back half catch)	3.3	3.2	3.3	3.2	3.3	3.2	3.3
Particulates, lb/MBtu(front and back half catch)	0.0078	0.0111	0.0077	0.0110	0.0077	0.0111	0.0079
PM10, lb/h (front half catch only)	1.8	1.7	1.8	1.7	1.8	1.7	1.8
PM10, lb/MBtu(front half catch only)	0.0042	0.0059	0.0042	0.0058	0.0042	0.0058	0.0043
PM10, lb/h (front and back half catch)	3.3	3.2	3.3	3.2	3.3	3.2	3.3
PM10, lb/MBtu(front and back half catch)	0.0078	0.0111	0.0077	0.0110	0.0077	0.0111	0.0079
NOTE: SO2 to SO3 conversion rate (assumed), wt%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Remaining SO2 in Exhaust Gas, lb/h	0.19	0.13	0.19	0.13	0.19	0.13	0.19
Amount of SO2 converted to SO3, lb/h	0.13	0.09	0.13	0.09	0.13	0.09	0.12
Maximum Exhaust Gas ammonium sulfate [(NH4)2-(SO4)] (assuming 100% conversion from SO3), lb/h	0.26	0.18	0.27	0.18	0.27	0.18	0.26
Maximum H2SO4 (assuming 100% conversion from SO3 to H2SO4), lb/hr	0.20	0.13	0.20	0.13	0.20	0.13	0.19
Stack							

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Case Number	1	2	3	4	5	6	7
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	60%	100%	60%	100%	60%	100%
CTG Inlet Air Conditioning In Operation?	No	No	No	No	No	No	Evap. Cooler
Ambient Temperature, F	15	15	25	25	36	36	59
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Stack Exit Temperature, F	764	682	793	702	819	722	848
Stack Diameter, ft (estimated)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Stack Flow, lb/h	1,130,760	947,880	1,110,240	936,720	1,082,880	914,400	1,041,480
Stack Flow, scfm	253,102	210,745	248,879	208,420	243,107	203,759	234,333
Stack Flow, acfm	601,187	467,147	605,081	470,077	603,525	467,258	594,685
Stack Exit Velocity, ft/s	128.0	99.0	128.0	100.0	128.0	99.0	126.0

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Case Number	1	2	3	4	5	6	7
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	60%	100%	60%	100%	60%	100%
CTG Inlet Air Conditioning In Operation?	No	No	No	No	No	No	Evap. Cooler
Ambient Temperature, F	15	15	25	25	36	36	59
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Post Combustion Emissions Control							
CO Catalyst							
CO removed in CO Catalyst, %wt	90%	90%	90%	90%	90%	90%	90%
CO removed in CO Catalyst, lb/h (includes CO correction as applied to CTG)	56.26	36.16	49.49	32.63	40.16	26.80	25.29
Selective Catalytic Reduction (SCR)							
NOx Removed, lb/h as NO2	36.89	25.45	37.35	25.64	37.36	25.53	36.14
NOx Removed, percent	85.6%	85.6%	85.6%	85.6%	85.6%	85.6%	85.6%
NH3 Slip, lb/h	6.2	4.3	6.3	4.3	6.3	4.3	6.1
Stack Exhaust Gas Analysis (Wet)							
Molecular Wt, lb/mol	28.2	28.4	28.2	28.4	28.2	28.4	28.1
Specific Volume, ft^3/lb	31.9	29.6	32.7	30.1	33.4	30.7	34.3
Specific Volume, scf/lb	13.4	13.3	13.5	13.4	13.5	13.4	13.5

Notes:

1. The emissions estimates shown in the table above are per stack.
2. The dry air composition used is 0.98% Ar, 78.03% N2 and 20.99%O2
3. Standard conditions are defined as 60 F, 14.696 psia, Norm conditions are defined as 0 C, 1.103 bar
4. The CTG performance is a GE AERO ENERGY PRODUCTS estimate.
5. The VOC oxidation rates are Black & Veatch estimates based on typical data.
6. UHC calculations do not include the effects of oxidation in the CO catalyst. The VOC/UHC ratio is assumed to be 20% for natural gas firing (typical for GE turbines).
7. The front half catch of particulate emissions is assumed to be half the amount of the front and back half catch.
particulates. The assumption that 100% SO3 is converted to ammonium sulfates results in "worst case" particulate emissions.
9. The SO2 oxidation rate was assumed to be 40%.

SR4/2 Preparer: J.Arthur Filepath: c:\bv-users_proj\hanford\[emission.xls]input Reviewer: P.Elrod

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Case Number	8	9	10	11	12	13	14
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	100%	60%	100%	60%	100%	60%
CTG Inlet Air Conditioning In Operation?	No	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler
Ambient Temperature, F	59	63	63	98	98	115	115
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Ambient Temperature, F	59.0	63.0	63.0	98.0	98.0	115.0	115.0
Ambient Relative Humidity, %	60.0	60.0	60.0	36.0	36.0	21.0	21.0
Atmospheric Pressure, psia	14.569	14.569	14.569	14.569	14.569	14.569	14.569
CTG Inlet Air Conditioning Effectiveness, %	0	85	85	85	85	85	85
CTG Compressor Inlet Dry Bulb Temperature, F	59.0	56.1	56.1	78.9	78.9	84.6	84.6
CTG Compr. Inlet Relative Humidity, %	60.2	92.9	92.9	85.9	85.9	79.4	79.4
Inlet Loss, in. H2O	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Exhaust Loss, in. H2O	6.0	6.0	6.0	6.0	6.0	6.0	6.0
CTG Performance Reference	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY	GE AERO ENERGY
CTG Load Level (percent of Base Load)	100%	100%	60%	100%	60%	100%	60%
Gross CTG Output, kW	46,573	46,859	27,972	42,075	25,091	40,923	24,396
Gross CTG Heat Rate, Btu/kWh (LHV)	8,706	8,499	9,797	8,664	10,213	8,712	10,317
Gross CTG Heat Rate, Btu/kWh (HHV)	9,635	9,406	10,842	9,588	11,302	9,641	11,417
CTG Heat Input, MBtu/h (LHV)	405.5	398.3	274.0	364.5	256.3	356.5	251.7
CTG Heat Input, MBtu/h (HHV)	448.7	440.7	303.3	403.4	283.6	394.6	278.5
CTG Water Injection Flow, lb/h	21,910	20,985	11,045	16,402	8,629	15,578	8,180
CTG Steam Injection Flow, lb/h	0	0	0	0	0	0	0
Injection Fluid/Fuel Ratio	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CTG Exhaust Flow, lb/h	1,029,240	1,035,000	863,280	972,720	801,000	956,520	785,160
CTG Exhaust Temperature, F	851	822	749	826	776	829	784
Total CTG Fuel Flow, lb/h	21,360	20,980	14,440	19,210	13,500	18,780	13,260
CTG Fuel Temperature, F	76	76	76	76	76	76	76
CTG Fuel LHV, Btu/lb	18,981	18,981	18,981	18,981	18,981	18,981	18,981
CTG Fuel HHV, Btu/lb	21,006	21,006	21,006	21,006	21,006	21,006	21,006
HHV/LHV Ratio	1.1067	1.1067	1.1067	1.1067	1.1067	1.1067	1.1067
CTG Fuel Composition (Ultimate Analysis by Weight)							
Ar	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C	68.44%	68.44%	68.44%	68.44%	68.44%	68.44%	68.44%
H2	21.38%	21.38%	21.38%	21.38%	21.38%	21.38%	21.38%
N2	8.80%	8.80%	8.80%	8.80%	8.80%	8.80%	8.80%
O2	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%	1.37%
S	0.00072%	0.00072%	0.00072%	0.00072%	0.00072%	0.00072%	0.00072%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25

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Case Number	8	9	10	11	12	13	14
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	100%	60%	100%	60%	100%	60%
CTG Inlet Air Conditioning In Operation?	No	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler
Ambient Temperature, F	59	63	63	98	98	115	115
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combustion Turbine Exhaust Emissions							
CTG Exhaust Analysis (Volume Basis - Wet)							
Ar	0.91%	0.90%	0.92%	0.90%	0.91%	0.90%	0.91%
CO2	3.33%	3.25%	2.70%	3.15%	2.71%	3.13%	2.71%
H2O	10.46%	10.53%	8.37%	11.22%	9.48%	11.37%	9.72%
N2	72.30%	72.19%	73.47%	71.59%	72.61%	71.45%	72.43%
O2	13.00%	13.13%	14.54%	13.14%	14.29%	13.15%	14.23%
SO2	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
NOx, ppmvd @15% O2	25.00	25.00	25.00	25.00	25.00	25.00	25.00
NOx, ppmvd	26.99	26.37	21.39	25.81	21.72	25.69	21.81
NOx, ppmvw (wet - uncorrected exhaust gas)	24.17	23.59	19.60	22.92	19.66	22.77	19.68
NOx, lb/h as NO2	41.7	41.0	28.5	37.6	26.7	36.8	26.3
NOx, lb/MBtu (LHV)	0.1028	0.1029	0.1040	0.1031	0.1043	0.1031	0.1043
NOx, lb/MBtu (HHV)	0.0929	0.0929	0.0940	0.0932	0.0942	0.0932	0.0943
CO, ppmvd @ 15% O2	30.00	24.00	23.00	10.00	9.00	8.00	8.00
CO, ppmvd	32.40	25.32	19.68	10.33	7.82	8.23	6.98
CO, ppmvw (wet - uncorrected exhaust gas)	29.01	22.65	18.03	9.17	7.08	7.29	6.30
CO, lb/h	30.7	24.4	16.4	9.9	6.6	8.0	5.9
CO, lb/MBtu (LHV)	0.0758	0.0612	0.0599	0.0272	0.0259	0.0224	0.0235
CO, lb/MBtu (HHV)	0.0685	0.0553	0.0541	0.0246	0.0234	0.0202	0.0213
NOTE: SO2 estimate does not include the effects of SO2 oxidation							
SO2, ppmvd @ 15% O2 (with no SO2 oxidation)	0.14	0.14	0.14	0.14	0.14	0.14	0.14
SO2, ppmvd (with no SO2 oxidation)	0.15	0.14	0.12	0.14	0.12	0.14	0.12
SO2, ppmvw (with no SO2 oxidation)(wet - uncorrected exhaust gas)	0.13	0.13	0.11	0.12	0.11	0.12	0.11
SO2, lb/h (with no SO2 oxidation)	0.31	0.30	0.21	0.28	0.19	0.27	0.19
SO2, lb/MBtu (LHV) (with no SO2 oxidation)	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
SO2, lb/MBtu (HHV) (with no SO2 oxidation)	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007

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Case Number	8	9	10	11	12	13	14
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	100%	60%	100%	60%	100%	60%
CTG Inlet Air Conditioning In Operation?	No	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler
Ambient Temperature, F	59	63	63	98	98	115	115
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Combustion Turbine Exhaust Emissions - continued							
UHC, ppmvd @ 15% O2	3.00	3.00	2.00	2.00	2.00	2.00	2.00
UHC, ppmvd	3.24	3.16	1.71	2.07	1.74	2.06	1.74
UHC, ppmvw (wet - uncorrected exhaust gas)	2.90	2.83	1.57	1.83	1.57	1.82	1.57
UHC, lb/h as CH4	2.2	2.2	1.3	1.5	1.2	1.5	1.2
UHC, lb/MBtu as CH4 (LHV)	0.0054	0.0055	0.0046	0.0042	0.0048	0.0042	0.0048
UHC, lb/MBtu as CH4 (HHV)	0.0049	0.0049	0.0042	0.0038	0.0043	0.0038	0.0043
VOC percentage of UHC	20%	20%	20%	20%	20%	20%	20%
VOC, ppmvd @ 15% O2	0.6	0.6	0.4	0.4	0.4	0.4	0.4
VOC, ppmvd	0.65	0.63	0.34	0.41	0.35	0.41	0.35
VOC, ppmvw (wet - uncorrected exhaust flow)	0.58	0.57	0.31	0.37	0.31	0.36	0.32
VOC, lb/h as CH4	0.3	0.3	0.2	0.2	0.1	0.2	0.1
VOC, lb/MBtu as CH4 (LHV)	0.0011	0.0011	0.0009	0.0008	0.0010	0.0008	0.0010
VOC, lb/MBtu as CH4 (HHV)	0.0010	0.0010	0.0008	0.0008	0.0009	0.0008	0.0009
Particulates, lb/h (front half catch only)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Particulates, lb/h (front and back half catch)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Particulates, lb/MBtu (LHV) (front half catch only)	0.0037	0.0038	0.0055	0.0041	0.0059	0.0042	0.0060
Particulates, lb/MBtu (HHV) (front half catch only)	0.0033	0.0034	0.0049	0.0037	0.0053	0.0038	0.0054
PM10, lb/h (front half catch only)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
PM10, lb/h (front and back half catch)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
PM10, lb/MBtu (LHV) (front and back half catch)	0.0074	0.0075	0.0109	0.0082	0.0117	0.0084	0.0119
PM10, lb/MBtu (HHV) (front and back half catch)	0.0067	0.0068	0.0099	0.0074	0.0106	0.0076	0.0108
CTG Wet (Total) Exhaust Gas Analysis							
Molecular Wt, lb/mol	28.13	28.11	28.30	28.03	28.18	28.01	28.15
Gas Constant, ft-lbf/lbm-R	54.930	54.960	54.600	55.120	54.830	55.160	54.880
Specific Volume, ft^3/lb	33.81	33.08	30.99	33.28	31.82	33.38	32.06
Exhaust Gas Flow, acfm	579,977	570,630	445,884	539,535	424,797	532,144	419,537
Specific Volume, scf/lb	13.49	13.50	13.41	13.54	13.46	13.54	13.48
Exhaust Gas Flow, scfm	231,407	232,875	192,943	219,510	179,691	215,855	176,399

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Case Number	8	9	10	11	12	13	14
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	100%	60%	100%	60%	100%	60%
CTG Inlet Air Conditioning In Operation?	No	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler
Ambient Temperature, F	59	63	63	98	98	115	115
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Stack Emissions							
NOTE: Exhaust Analysis does not include the effects of post combustion control							
Stack Exhaust Analysis (Volume Basis - Wet)							
Ar	0.91%	0.90%	0.92%	0.90%	0.91%	0.90%	0.91%
CO2	3.33%	3.25%	2.70%	3.15%	2.71%	3.13%	2.71%
H2O	10.46%	10.53%	8.37%	11.22%	9.48%	11.37%	9.72%
N2	72.30%	72.19%	73.47%	71.59%	72.61%	71.45%	72.43%
O2	13.00%	13.13%	14.54%	13.14%	14.29%	13.15%	14.23%
SO2	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%	0.00001%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Stack Emissions							
NOx, ppmvd @15% O2 w/o SCR (does not account for added margin	25.00	25.00	25.00	25.00	25.00	25.00	25.00
NOx, ppmvd w/o SCR	26.99	26.37	21.39	25.81	21.72	25.69	21.81
NOx, ppmvw w/o SCR	24.17	23.59	19.60	22.92	19.66	22.77	19.68
NOx, lb/h as NO2 w/o SCR (includes correction adder)	41.69	40.96	28.51	37.59	26.72	36.77	26.26
NOx, lb/MBtu (LHV) as NO2 w/o SCR	0.1028	0.1029	0.1040	0.1031	0.1043	0.1031	0.1043
NOx, lb/MBtu (HHV) as NO2 w/o SCR	0.0929	0.0929	0.0940	0.0932	0.0942	0.0932	0.0943
NOx, ppmvd @15% O2 w/ SCR	3.60	3.60	3.60	3.60	3.60	3.60	3.60
NOx, ppmvd w SCR	3.89	3.80	3.08	3.72	3.13	3.70	3.14
NOx, ppmvw w SCR	3.48	3.40	2.82	3.30	2.83	3.28	2.83
NOx, lb/h as NO2 w/ SCR (includes NOx margin applied to CTG)	6.00	5.90	4.10	5.41	3.85	5.30	3.78
NOx, lb/MBtu (LHV) as NO w SCR	0.0148	0.0148	0.0150	0.0148	0.0150	0.0149	0.0150
NOx, lb/MBtu (HHV) as NO2 w SCR	0.0134	0.0134	0.0135	0.0134	0.0136	0.0134	0.0136
SCR NH3 slip, ppmvd @15% O2	10.00	10.00	10.00	10.00	10.00	10.00	10.00
SCR NH3 slip, lb/h	6.03	5.92	4.07	5.42	3.81	5.30	3.74
CO, ppmvd @ 15% O2 w/o Catalyst	30.00	24.00	23.00	10.00	9.00	8.00	8.00
CO, ppmvd w/o Catalyst	32.40	25.32	19.68	10.33	7.82	8.23	6.98
CO, ppmvw w/o Catalyst	29.01	22.65	18.03	9.17	7.08	7.29	6.30
CO, lb/h w/o Catalyst (includes CO correction as applied to CTG and margin)	30.73	24.36	16.41	9.92	6.63	7.97	5.92
CO, lb/MBtu (LHV) w/o SCR	0.0758	0.0612	0.0599	0.0272	0.0259	0.0224	0.0235
CO, lb/MBtu (HHV) w/o SCR	0.0685	0.0553	0.0541	0.0246	0.0234	0.0202	0.0213
CO Reduction % w/ Catalyst	90%	90%	90%	90%	90%	90%	90%
CO, ppmvd @ 15% O2 w/ Catalyst	3.00	2.40	2.30	1.00	0.90	0.80	0.80
CO, ppmvd w/ Catalyst	3.24	2.53	1.97	1.03	0.78	0.82	0.70
CO, ppmvw w/ Catalyst	2.90	2.27	1.80	0.92	0.71	0.73	0.63
CO, lb/h w/ Catalyst (includes CO margin applied to CTG)	3.07	2.44	1.64	0.99	0.66	0.80	0.59
CO, lb/MBtu (LHV) w SCR	0.0076	0.0061	0.0060	0.0027	0.0026	0.0022	0.0024
CO, lb/MBtu (HHV) w SCR	0.0068	0.0055	0.0054	0.0025	0.0023	0.0020	0.0021
SO2, ppmvd@15% O2 w/o scrubber (with no SO2 oxidation)	0.136	0.136	0.136	0.136	0.136	0.136	0.136
SO2, ppmvd w/o scrubber (with no SO2 oxidation)	0.15	0.14	0.12	0.14	0.12	0.14	0.12

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Case Number	8	9	10	11	12	13	14
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	100%	60%	100%	60%	100%	60%
CTG Inlet Air Conditioning In Operation?	No	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler
Ambient Temperature, F	59	63	63	98	98	115	115
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
SO2, ppmvw w/o scrubber (with no SO2 oxidation)	0.13	0.13	0.11	0.12	0.11	0.12	0.11
SO2, lb/h w/o scrubber (with no SO2 oxidation)	0.31	0.30	0.21	0.28	0.19	0.27	0.19
SO2, lb/MBtu (LHV) w/o scrubber	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
SO2, lb/MBtu (HHV) w/o scrubber	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007

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Case Number	8	9	10	11	12	13	14
CTG Model	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000	LM6000
Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	100%	60%	100%	60%	100%	60%
CTG Inlet Air Conditioning In Operation?	No	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler
Ambient Temperature, F	59	63	63	98	98	115	115
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Stack Emissions - continued							
NOTE: UHC calculations do NOT include the effect of any oxidation in the CO catalyst.							
UHC, ppmvd @ 15% O2	3.00	3.00	2.00	2.00	2.00	2.00	2.00
UHC, ppmvd	3.24	3.16	1.71	2.07	1.74	2.06	1.74
UHC, ppmvw	2.90	2.83	1.57	1.83	1.57	1.82	1.57
UHC, lb/h as CH4	2.20	2.17	1.27	1.52	1.22	1.50	1.20
UHC, lb/MBtu (LHV)	0.0054	0.0055	0.0046	0.0042	0.0048	0.0042	0.0048
UHC, lb/MBtu (HHV)	0.0049	0.0049	0.0042	0.0038	0.0043	0.0038	0.0043
VOC, ppmvd @ 15% O2 w/o Catalyst	0.60	0.60	0.40	0.40	0.40	0.40	0.40
VOC, ppmvd w/o Calatyst	0.65	0.63	0.34	0.41	0.35	0.41	0.35
VOC, ppmvw w/o Catalyst	0.58	0.57	0.31	0.37	0.31	0.36	0.32
VOC, lb/h as CH4 w/o Catalyst (includes correction adder)	0.34	0.33	0.15	0.20	0.14	0.20	0.14
VOC, lb/MBtu (LHV) w/o CO catalyst	0.0008	0.0008	0.0006	0.0006	0.0006	0.0006	0.0006
VOC, lb/MBtu (HHV) w/o CO catalyst	0.0008	0.0008	0.0005	0.0005	0.0005	0.0005	0.0005
VOC Reduction % w/ Catalyst	0%	0%	0%	0%	0%	0%	0%
VOC, ppmvd @ 15% O2 w/ Catalyst	0.60	0.60	0.40	0.40	0.40	0.40	0.40
VOC, ppmvd w/ Calatyst	0.65	0.63	0.34	0.41	0.35	0.41	0.35
VOC, ppmvw w/ Catalyst	0.58	0.57	0.31	0.37	0.31	0.36	0.32
VOC, lb/h as CH4 w/ Catalyst (includes VOC correction as applied to CTG)	0.34	0.33	0.15	0.20	0.14	0.20	0.14
VOC, lb/MBtu (LHV) w CO catalyst	0.0008	0.0008	0.0006	0.0006	0.0006	0.0006	0.0006
VOC, lb/MBtu (HHV) w CO catalyst	0.0008	0.0008	0.0005	0.0005	0.0005	0.0005	0.0005
Particulate without the effect of SO2 oxidation and SCR catalysts							
Particulates, lb/h (front half catch only)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Particulates, lb/MBtu (front half catch only)	0.0037	0.0038	0.0055	0.0041	0.0059	0.0042	0.0060
Particulates, lb/h (front and back half catch)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Particulates, lb/MBtu (front and back half catch)	0.0074	0.0075	0.0109	0.0082	0.0117	0.0084	0.0119
PM10, lb/h (front half catch only)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
PM10, lb/MBtu (front half catch only)	0.0037	0.0038	0.0055	0.0041	0.0059	0.0042	0.0060
PM10, lb/h (front and back half catch)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
PM10, lb/MBtu (front and back half catch)	0.0074	0.0075	0.0109	0.0082	0.0117	0.0084	0.0119
Particulate including the effect of SO2 oxidation and SCR catalysts [includes (NH4)2-(SO4)]							
Particulates, lb/h (front half catch only)	1.8	1.8	1.7	1.7	1.7	1.7	1.7
Particulates, lb/MBtu(front half catch only)	0.0043	0.0044	0.0061	0.0047	0.0065	0.0048	0.0066
Particulates, lb/h (front and back half catch)	3.3	3.3	3.2	3.2	3.2	3.2	3.2
Particulates, lb/MBtu(front and back half catch)	0.0080	0.0082	0.0116	0.0089	0.0123	0.0090	0.0125
PM10, lb/h (front half catch only)	1.8	1.8	1.7	1.7	1.7	1.7	1.7
PM10, lb/MBtu(front half catch only)	0.0043	0.0044	0.0061	0.0047	0.0065	0.0048	0.0066
PM10, lb/h (front and back half catch)	3.3	3.3	3.2	3.2	3.2	3.2	3.2
PM10, lb/MBtu(front and back half catch)	0.0080	0.0082	0.0116	0.0089	0.0123	0.0090	0.0125
NOTE: SO2 to SO3 conversion rate (assumed), wt%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Remaining SO2 in Exhaust Gas, lb/h	0.18	0.18	0.13	0.17	0.12	0.16	0.11
Amount of SO2 converted to SO3, lb/h	0.12	0.12	0.08	0.11	0.08	0.11	0.08
Maximum Exhaust Gas ammonium sulfate [(NH4)2-(SO4)] (assuming 100% conversion from SO3), lb/h	0.25	0.25	0.17	0.23	0.16	0.22	0.16
Maximum H2SO4 (assuming 100% conversion from SO3 to H2SO4), lb/hr	0.19	0.19	0.13	0.17	0.12	0.17	0.12
Stack							

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Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	100%	60%	100%	60%	100%	60%
CTG Inlet Air Conditioning In Operation?	No	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler
Ambient Temperature, F	59	63	63	98	98	115	115
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Stack Exit Temperature, F	851	822	749	826	776	829	784
Stack Diameter, ft (estimated)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Stack Flow, lb/h	1,029,240	1,035,000	863,280	972,720	801,000	956,520	785,160
Stack Flow, scfm	231,407	232,875	192,943	219,510	179,691	215,855	176,399
Stack Flow, acfm	588,725	579,083	452,503	547,641	431,072	540,115	425,688
Stack Exit Velocity, ft/s	125.0	123.0	96.0	116.0	91.0	115.0	90.0

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Diluent	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42	DN 9/42
CTG Fuel Type	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas	Cust Gas
CTG Load	100%	100%	60%	100%	60%	100%	60%
CTG Inlet Air Conditioning In Operation?	No	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler	Evap. Cooler
Ambient Temperature, F	59	63	63	98	98	115	115
HRSG Firing	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired	Unfired
Fuel Sulfur Content (grains/100 standard cubic feet)	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Post Combustion Emissions Control							
CO Catalyst							
CO removed in CO Catalyst, %wt	90%	90%	90%	90%	90%	90%	90%
CO removed in CO Catalyst, lb/h (includes CO correction as applied to CTG)	27.66	21.92	14.77	8.92	5.97	7.18	5.33
Selective Catalytic Reduction (SCR)							
NOx Removed, lb/h as NO2	35.69	35.07	24.40	32.18	22.87	31.48	22.48
NOx Removed, percent	85.6%	85.6%	85.6%	85.6%	85.6%	85.6%	85.6%
NH3 Slip, lb/h	6.0	5.9	4.1	5.4	3.8	5.3	3.7
Stack Exhaust Gas Analysis (Wet)							
Molecular Wt, lb/mol	28.1	28.1	28.3	28.0	28.2	28.0	28.2
Specific Volume, ft^3/lb	34.3	33.6	31.5	33.8	32.3	33.9	32.5
Specific Volume, scf/lb	13.5	13.5	13.4	13.5	13.5	13.5	13.5

Notes:

1. The emissions estimates shown in the table above are per stack.
2. The dry air composition used is 0.98% Ar, 78.03% N2 and 20.99%O2
3. Standard conditions are defined as 60 F, 14.696 psia, Norm conditions are defined as 0 C, 1.103 bar
4. The CTG performance is a GE AERO ENERGY PRODUCTS estimate.
5. The VOC oxidation rates are Black & Veatch estimates based on typical data.
6. UHC calculations do not include the effects of oxidation in the CO catalyst. The VOC/UHC ratio is assumed to be 20% for natural gas firing (typical for GE turbines).
7. The front half catch of particulate emissions is assumed to be half the amount of the front and back half catch.
particulates. The assumption that 100% SO3 is converted to ammonium sulfates results in "worst case" particulate emissions.
9. The SO2 oxidation rate was assumed to be 40%.

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