

Table 3.7-3 - KIF Coal Retirement/Replacement EIS - Operational Air Emissions Comparisons - Only Direct Impact TVA Facilities

Pollutant	(Abbrev.)	KIF 3-Year Avg. Annual Operational Emissions (2018-2020) (tons/yr)	Proposed CC Plant at KIF - Alternative A Operational Emissions (tons/yr)	Proposed CTs at KIF - Alternative A Operational Emissions (tons/yr)	Total Alternative A Proposed Operational Emissions (tons/yr)	Change in KIF Operational Emissions - Alternative A (tons/yr)	Change in KIF Operational Emissions - Alternative B - Solar/Battery Storage (tons/yr)
Particulate Matter/Total Suspended Particulate (Filterable only)	PM/TSP	185.0	41.8	8.0	49.7	-135.3	-185.0
Total PM<10 microns (Filterable+Condensable)	PM ₁₀	328.7	73.6	29.4	103.1	-225.6	-328.7
Total PM<2.5 microns (Filterable+Condensable)	PM _{2.5}	266.3	73.6	29.4	103.1	-163.2	-266.3
Sulfur Dioxide	SO ₂	1,374.3	6.5	2.2	8.6	-1,365.7	-1,374.3
Nitrogen Oxides	NOx	1,038.7	269.4	149.3	418.6	-620.1	-1,038.7
Carbon Monoxide	CO	381.7	170.6	339.5	510.1	128.4	-381.7
Volatile Organic Compounds	VOC	45.7	32.2	52.0	84.2	38.5	-45.7
Sulfuric Acid	H ₂ SO ₄	147.3	0.0	0.0	0.0	-147.3	-147.3
Ammonia	NH ₃	12.8	63.1	0.0	63.1	50.3	-12.8
Carbon Dioxide	CO ₂	3,386,666.7	1,294,181.3	441,803.6	1,735,984.9	-1,650,681.8	-3,386,666.7
Methane	CH ₄	34.5	83.1	31.7	114.7	80.2	-34.5
Nitrous Oxide	N ₂ O	54.8	28.7	11.0	39.8	-15.0	-54.8
CO ₂ equivalent (GHGs)	CO ₂ -e	3,403,333.3	1,304,818.9	445,886.6	1,750,705.5	-1,652,627.8	-3,403,333.3
Mercury ⁽¹⁾	Hg	8.0E-03	No Data	No Data	No Data	-8.0E-03	-8.0E-03
Lead ⁽¹⁾	Pb	No Data	No Data	No Data	No Data	No Data	No Data

⁽¹⁾ = Additional hazardous air pollutants are emitted from fossil fuel combustion but in negligible quantities, except for hydrogen fluoride (HF) and hydrogen chloride (HCl) from coal combustion. HF and HCl emissions from coal burning would be eliminated with the switch to natural gas combustion turbines. Current lead emissions data is not available but based on historical data is expected to be insignificant.

NA = Not Applicable

Table 3.7-4 - KIF Coal Retirement/Replacement EIS - Net Social Benefit from Operational Emissions Reductions for Alternatives A and B - Only Direct Impact TVA Facilities (2027) - B

GHG Pollutant	(Abbrev.)	Nominal SCC Rate (\$/mt) (2028)	Nominal SCC Rate (\$/ton) (2028)	SCC Benefit - Alternative A (2028, Dollars)	SCC Benefit - Alternative B (2028, Dollars)
Carbon Dioxide	CO ₂	\$ 70	\$ 64	\$ (105,301,463)	\$ (216,044,636)

Notes: 2028 SCC is presented as this is the first full year that Alternatives A and B are planned to begin operation. 3% discount rate used. Costs based on global impacts.

KIF Coal Retirement/Replacement EIS - GHG Proxy Analysis

	KIF - Alternative A	Solar/Battery Storage - Alternative B
KIF EIS Alternatives Net Change in CO ₂ emissions (2027) (tons/yr)	-1,650,682	-3,386,667
KIF EIS Alternatives Net Change in CO ₂ emissions (2027) (metric tons/yr)	-1,497,474	-3,072,333
KIF EIS Alternatives Net Change in CO ₂ emissions (2027) (Million metric tons/yr)	-1.5	-3.1
2018 Tennessee CO ₂ emissions from Energy Consumption (Million metric tons)	94.7	94.7
2020 U.S. CO ₂ emissions from Energy Consumption (Million metric tons)	4,576.3	4,576.3
2020 Global CO ₂ emissions from Energy Consumption (Million metric tons)	31,500.0	31,500.0
% of Tennessee CO ₂ emissions from Energy Consumption	-1.58	-3.24
% of U.S. CO ₂ emissions from Energy Consumption	-0.03	-0.07
% of Global CO ₂ emissions from Energy Consumption	-0.005	-0.01

Combined Cycle (CC) Gas Turbines at TVA Kingston: One CC Generation Train

Table 1. Operational Data

Parameter	Value	Units	Comment
Total Generation	673	MW	Total generation for one CC train (Summer capacity) consisting of two combustion turbines and one steam turbine (2x1 configuration).
Design Max. Natural Gas Amount	90	MMscf/day	where "MM" denotes "10 ⁶ "
Annual Average Capacity Factor	55	%	Energy Information Agency (EIA) CC industry average over the last 10 years; from EIA website: https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_a
Natural Gas Heat Content	1,020	Btu/scf	AP-42, Section 3.1 - Stationary Gas Turbines, Table 3.1-2a, footnote c, average natural gas heating value (HHV) of 1,020 Btu/scf at 60 degrees F.
Annual Avg Natrl Gas Usage	18,496,302	MMBtu/yr	Average annual natural gas usage over the life of the CC train

Table 2. Expected Emission Limits/Factors

Constituent	Value	Units	Comment
Nitrogen Oxides (as NO ₂)	NO ₂ 2.0	ppmvd [1]	Expected SCR performance (based on BACT of comparable CC units) achieved over the life of the plant
Carbon Monoxide	CO 2.0	ppmvd [1]	Manufacturer's guarantee (based on BACT of comparable CC units)
Volatile Organic Compounds	VOC 2.0	ppmvd [1]	Manufacturer's guarantee (based on BACT of comparable CC units)
Filterable PM/TSP	FPM 4.20E-03	lb/MMBtu	USEPA RBLC Database, 2016-2021, avg. after leaving out lowest and highest
Total PM ₁₀ /2.5	TPM _{2.5} 6.70E-03	lb/MMBtu	USEPA RBLC Database, 2016-2021, avg. after leaving out lowest and highest
Sulfur Dioxide	SO ₂ 6.00E-04	lb/MMBtu	40 CFR Part 75, Appendix D, 2.3.1.1.1, default SO ₂ emission rate for firing pipeline natural gas
Ammonia Slip	NH ₃ 5.0	ppmvd [1]	Engineering estimate of unreacted SCR ammonia (ammonia slip)
Carbon Dioxide	CO ₂ 120	lb/MMBtu	40 CFR Part 60, Subpart TTTT
Methane	CH ₄ 8.60E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a
Nitrous Oxide	N ₂ O 3.00E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a

Tbl 2 [1] Concentration in parts-per-million (ppm) by volume, dry-basis (ppmvd), at 15% O₂; concentration is converted to an emission factor (lb/MMBtu) via the following:

$$EF (\text{lb/MMBtu}) = \text{ppmvd} * F_d * 20.9 / (20.9 - \%O_2d) * MW / 385.3$$

where... "ppmvd" denotes constituent concentration;

"F_d" is the 40 CFR 60, App. A, Ref. Method 19, Table 19-2, dry-basis "F-Factor": 8710 dscf/MMBtu;

"%O₂d" is the (ref. method) percent oxygen, dry-basis: 15 %;

"MW" is molecular weight (lb/lbmol): NO₂ = 46.01 CO = 28.01 VOC* = 16.04 NH₃ = 17.03

*VOC as methane, which is representative of the highest stack-exit concentration guaranteed by the manufacturer

The molar volume of any ideal gas at standard temp. and pressure is 385.3 lbmol/scf

Table 3. Emission Estimates [1]

Constituent	Value	Units	Note
Nitrogen Oxides (as NO ₂)	NO ₂ 68	tons/yr	
Carbon Monoxide	CO 41	tons/yr	
VOC as CH ₄	VOC 24	tons/yr	
Filterable PM/TSP	FPM 39	tons/yr	
Total PM ₁₀ /2.5	TPM _{2.5} 62	tons/yr	
Sulfur Dioxide	SO ₂ 6	tons/yr	
Ammonia Slip	NH ₃ 63	tons/yr	
Carbon Dioxide	CO ₂ 1,109,778	tons/yr	
Methane	CH ₄ 80	tons/yr	
Nitrous Oxide	N ₂ O 28	tons/yr	
CO ₂ equivalent	CO ₂ e 1,120,034	tons/yr	2

Tbl 3 [1] Estimates based on the following: E (tons/year) = EF * Annual Avg Natrl Gas Usage / 2000

Tbl 3 [2] CO₂e based on US EPA, Code of Federal Regulations, Title 40, Part 98, Subpart A, Table A-1, as amended 11-29-13 (78 FR 71904), 100-Year Horizon Global Warming Potentials (GWP) of 25 for CH₄ and 298 for N₂O.

Natural Gas-Fired Auxiliary Boiler

Table 1. Operational Data

Parameter	Value	Units	Comment
Number of Units	1		
Maximum Heat Input (each)	80	MMBtu/hr	
Annual Average Capacity Factor	45	%	Auxiliary boilers service the CC trains and will only operate as needed; conservatively assumed inverse of the CC capacity factor (100% - 55% = 45%).
Natural Gas Heat Content	1,020	Btu/scf	AP-42
Design Max. Natural Gas Amount (each)	315,360	MMBtu/yr	Annual average natural gas usage over the life of the plant

Table 2. Expected Emission Limits/Factors

Constituent	Value	Units	Comment
Nitrogen Oxides (as NO ₂)	NO ₂	50	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-1 (Low-NOX Burner)
Carbon Monoxide	CO	84	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-1
Volatile Organic Compounds	VOC	5.5	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Filterable PM/TSP	FPM	1.9	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Total PM ₁₀ /2.5	TPM _{2.5}	7.6	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Sulfur Dioxide	SO ₂	0.6	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Carbon Dioxide	CO ₂	120,000	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Methane	CH ₄	2.30E+00	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Nitrous Oxide	N ₂ O	6.40E-01	lb/MMscf EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2

Table 3. Emission Estimates [1]

Constituent	Value	Units	Note
Nitrogen Oxides (as NO ₂)	NO ₂	8	tons/yr
Carbon Monoxide	CO	13	tons/yr
VOC as CH ₄	VOC	1	tons/yr
Filterable PM/TSP	FPM	0	tons/yr
Total PM ₁₀ /2.5	TPM _{2.5}	1	tons/yr
Sulfur Dioxide	SO ₂	0.1	tons/yr
Carbon Dioxide	CO ₂	18,551	tons/yr
Methane	CH ₄	0	tons/yr
Nitrous Oxide	N ₂ O	0	tons/yr
CO ₂ equivalent	CO ₂ e	18,589	tons/yr 2

Tbl 3 [1] Estimates based on the following: $E \text{ (tons/year)} = EF / \text{NatrI Gas Heat Content} * \text{Annual Avg NatrI Gas Usage} / 2000 * \text{No. of Units}$

Tbl 3 [2] CO₂e based on US EPA, Code of Federal Regulations, Title 40, Part 98, Subpart A, Table A-1, as amended 11-29-13 (78 FR 71904), 100-Year Horizon Global Warming Potentials (GWP) of 25 for CH₄ and 298 for N₂O.

The CC plant will have one diesel fire water pump emergency engine rated at 275 horsepower; however, emissions will be negligible compared to the CC train and auxiliary boiler. There are no dew point heaters for Alternative A.

Natural Gas-Fired Duct Burner

Table 1. Operational Data

Parameter	Value	Units	Comment
Number of Units	1		
Maximum Heat Input	1,064	MMBtu/hr	Nominal rating
Annual Average Capacity Factor	55	%	Duct Burner services the CC train and will only operate as needed; same capacity factor as CC train.
Natural Gas Heat Content	1,020	Btu/scf	AP-42
Design Max. Natural Gas Amount (each)	5,126,352	MMBtu/yr	Annual average natural gas usage over the life of the plant

Table 2. Expected Emission Limits/Factors

Constituent	Value	Units	Comment
Nitrogen Oxides (as NO ₂)	140	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-1, Large Boilers (>100 MMBtu/hr), Assume Low-NO _x Burner
Carbon Monoxide	84	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-1, Large Boilers (>100 MMBtu/hr), Assume Low-NO _x Burner
Volatile Organic Compounds	5.5	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Filterable PM/TSP	1.9	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Total PM ₁₀ /2.5	7.6	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Sulfur Dioxide	0.6	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Carbon Dioxide	120,000	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Methane	2.30E+00	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2
Nitrous Oxide	6.40E-01	lb/MMscf	EPA AP-42, Vol. I, 5th Ed., Sec. 1.4 - Natural Gas Combustion - Supp. D, 4/98, Table 1.4-2

Table 3. Emission Estimates [1]

Constituent	Value	Units	Note
Nitrogen Oxides (as NO ₂)	193	tons/yr	
Carbon Monoxide	116	tons/yr	
VOC as CH ₄	8	tons/yr	
Filterable PM/TSP	3	tons/yr	
Total PM ₁₀ /2.5	11	tons/yr	
Sulfur Dioxide	1	tons/yr	
Carbon Dioxide	165,853	tons/yr	
Methane	3	tons/yr	
Nitrous Oxide	1	tons/yr	
CO ₂ equivalent	166,196	tons/yr	2

Tbl 3 [1] Estimates based on the following: $E \text{ (tons/year)} = EF / \text{NatrI Gas Heat Content} * \text{Annual Avg NatrI Gas Usage} / 2000 * \text{No. of Units}$

Tbl 3 [2] CO₂e based on US EPA, Code of Federal Regulations, Title 40, Part 98, Subpart A, Table A-1, as amended 11-29-13 (78 FR 71904), 100-Year Horizon Global Warming Potentials (GWP) of 25 for CH₄ and 298 for N₂O.

**Aeroderivative Simple Cycle (CTs) Gas Turbines at TVA Kingston: 16 CT Units
Ultra-Low Sulfur Diesel Backup Fuel**

Table 1. Operational Data

Parameter	Value	Units	Comment
Total Generation	848	MW	Approximated total generation for 16 Aeroderivative CT units; 53 MW/CT
Number of CTs	16		
Estimated Max. Heat Input (each CT)	517	MMBtu/hr	CT Design basis; where "MM" denotes "10 ⁶ ". Manufacturer's data
Annual Average Capacity Factor	10	%	Energy Information Agency (EIA) CT industry average over the last 10 years; from EIA website: https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_a
Natural Gas Heat Content	1,020	Btu/scf	AP-42, Section 3.1 - Stationary Gas Turbines, Table 3.1-2a, footnote c, average natural gas heating value (HHV) of 1,020 Btu/scf at 60 degrees F.
Annual Avg. Natural Gas Usage (each CT)	448,256	MMBtu/yr	Average annual natural gas usage over the life of a CT. Accounts for time on ULSD and start/stop cycle time.
Start/Stop Cycles/Year/Turbine	250	cycles/yr/turbine	Estimate from design data provider.
Time per Start/Stop Cycle	0.17	hours/cycle	Per manufacturer (GE) design data indicating 5-minute start time and assumed stop time is the same.
Backup Fuel Use Limit (ULSD)	138,394	gal/yr	Assumed based on maximum of 48 hours operation per year on ULSD at rated capacity of 395 MMBtu/hr
Heating Value of ULSD	137,000	Btu/gal	AP-42, Appendix A, Typical Parameters of Various Fuels, Diesel

Table 2. Expected Emission Limits/Factors - Primary Fuel (Natural Gas), Continuous Operation

Constituent	Value	Units	Comment
Nitrogen Oxides (as NO ₂)	NO ₂ 9.0	ppmvd [1]	Manufacturer's guarantee (based on BACT of comparable CC units)
Carbon Monoxide	CO 9.0	ppmvd [1]	Manufacturer's guarantee (based on BACT of comparable CC units)
Volatile Organic Compounds	VOC 1.9	ppmvd [1]	USEPA RBL Database, 2016-2021, avg. after leaving out lowest and highest
Filterable PM/TSP	FPM 1.90E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a
Total PM ₁₀ /2.5	TPM _{2.5} 7.60E-03	lb/MMBtu	USEPA RBL Database, 2016-2021, avg. after leaving out lowest and highest
Sulfur Dioxide	SO ₂ 6.00E-04	lb/MMBtu	40 CFR Part 75, Appendix D, 2.3.1.1.1, default SO ₂ emission rate for firing pipeline natural gas
Carbon Dioxide	CO ₂ 120	lb/MMBtu	40 CFR Part 60, Subpart TTTT
Methane	CH ₄ 8.60E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a
Nitrous Oxide	N ₂ O 3.00E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a

Tbl 2 [1] Concentration in parts-per-million (ppm) by volume, dry-basis (ppmvd), at 15% O₂; concentration is converted to an emission factor (lb/MMBtu) via the following:

$$EF \text{ (lb/MMBtu)} = \text{ppmvd} * F_d * 20.9 / (20.9 - \%O_2d) * MW / 385.3$$

where... "ppmvd" denotes constituent concentration;

"F_d" is the 40 CFR 60, App. A, Ref. Method 19, Table 19-2, dry-basis "F-Factor":

$$8710 \text{ dscf/MMBtu};$$

"%O₂d" is the (ref. method) percent oxygen, dry-basis:

$$15 \text{ \%};$$

"MW" is molecular weight (lb/lbmol):

$$NO_2 = 46.01 \quad CO = 28.01 \quad VOC^* = 16.04$$

*VOC as methane, which is representative of the highest stack-exit concentration guaranteed by the manufacturer

The molar volume of any ideal gas at standard temp. and pressure is

$$385.3 \text{ lbmol/scf}$$

Table 3. Expected Emission Limits/Factors - Primary Fuel (Natural Gas) - Start/Stop Cycles

Constituent	Value	Units	Comment
Nitrogen Oxides (as NO ₂)	NO ₂ 86.4	lbs/hr	lbs/hr NO _x BACT Limit - USEPA RBL Database, 2016-2022 Search, Simple Cycle Gas Turbine @ 2,201 MMBtu/hr rating (RBL ID = LA-0327)
Carbon Monoxide	CO 800.1	lbs/hr	lbs/hr CO BACT Limit - USEPA RBL Database, 2016-2022 Search, Simple Cycle Gas Turbine @ 2,201 MMBtu/hr rating (RBL ID = LA-0327)
Volatile Organic Compounds	VOC 129.6	lbs/hr	lbs/hr VOC BACT Limit - Assumed 1.5 times the NO _x BACT limit based on similar proportion of NO _x to VOC BACT limits for other CTs.
Filterable PM/TSP	FPM 3.15	lbs/hr	lbs/hr PM BACT Limit - Assume 50% of the PM-10/PM-2.5 limit for RBL ID = LA-0327
Total PM ₁₀ /2.5	TPM _{2.5} 6.3	lbs/hr	lbs/hr PM-2.5 BACT Limit - USEPA RBL Database, 2016-2022 Search, Simple Cycle Gas Turbine @ 2,201 MMBtu/hr rating (RBL ID = LA-0327)
Sulfur Dioxide	SO ₂ 0	---	Assumed SO ₂ Start/Stop emissions are negligible
Carbon Dioxide	CO ₂ 120	lb/MMBtu	40 CFR Part 60, Subpart TTTT
Methane	CH ₄ 8.60E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a
Nitrous Oxide	N ₂ O 3.00E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a

Table 4. Expected Emission Limits/Factors - Backup Fuel (ULSD)

Constituent	Value	Units	Comment
Nitrogen Oxides (as NO ₂)	NO ₂ 42.0	ppmvd [1]	NO _x BACT limit per USEPA RBL Database, 2012-2022 search, Large Simple Cycle Combustion Turbine, Liquid fuel, Process Type 15.190 (RBL ID = TX-0794)
Carbon Monoxide	CO 20.0	ppmvd [1]	CO BACT limit per USEPA RBL Database, 2012-2022 search, Large Simple Cycle Combustion Turbine, Liquid fuel, Process Type 15.190 (RBL ID = TX-0794)
Volatile Organic Compounds	VOC 1.0	ppmvd [1]	VOC BACT limit per USEPA RBL Database, 2012-2022 search, Large Simple Cycle Combustion Turbine, Liquid fuel, Process Type 15.190 (RBL ID = TX-0794; 171 MW/CT); prorated based on 171 MW/CT vs. 50 MW/CT
Filterable PM/TSP	FPM 1.20E-02	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a
Total PM ₁₀ /2.5	TPM _{2.5} 7.20E-03	lb/MMBtu	USEPA RBL Database, 2016-2021, avg. after leaving out lowest and highest
Sulfur Dioxide	SO ₂ 1.52E-03	lb/MMBtu	40 CFR Part 75, Appendix D, 2.3.1.1.1, default SO ₂ emission rate for firing pipeline natural gas

Carbon Dioxide	CO2	120	lb/MMBtu	40 CFR Part 60, Subpart TTTT
Methane	CH4	8.60E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a
Nitrous Oxide	N2O	3.00E-03	lb/MMBtu	EPA AP-42, Vol. I, 5th Ed., Section 3.1 - Stationary Gas Turbines - Supp. F, 4/00, Table 3.1-2a

Tbl 4 [1] Concentration in parts-per-million (ppm) by volume, dry-basis (ppmvd), at 15% O2; concentration is converted to an emission factor (lb/MMBtu) via the following:

$$EF \text{ (lb/MMBtu)} = \text{ppmvd} * Fd * 20.9 / (20.9 - \%O2d) * MW / 385.3$$

where... "ppmvd" denotes constituent concentration;

"Fd" is the 40 CFR 60, App. A, Ref. Method 19, Table 19-2, dry-basis "F-Factor", Oil: 9190 dscf/MMBtu;

"%O2d" is the (ref. method) percent oxygen, dry-basis: 15 %;

"MW" is molecular weight (lb/lbmol): NO2 = 46.01 CO = 28.01 VOC* = 16.04

*VOC as methane, which is representative of the highest stack-exit concentration guaranteed by the manufacturer

The molar volume of any ideal gas at standard temp. and pressure is 385.3 lbmol/scf

Table 5. Emission Estimates [1] - Both Fuels and Start/Stop Cycles

Constituent	Primary Fuel			Note	Start/Stop Cycles			Backup Fuel			TOTAL Emissions	
	(NG)	Units	Units		Units	Units	Units	(ULSD)	Units	Units	Units	Units
Nitrogen Oxides (as NO2)	NO2	119	tons/yr	[1]	29	tons/yr	[4]	2	tons/yr	[5]	149	tons/yr
Carbon Monoxide	CO	72	tons/yr	[1]	267	tons/yr	[4]	0	tons/yr	[5]	340	tons/yr
VOC as CH4	VOC	9	tons/yr	[1]	43	tons/yr	[4]	0	tons/yr	[5]	52	tons/yr
Filterable PM/TSP	FPM	7	tons/yr	[1]	1	tons/yr	[4]	0	tons/yr	[5]	8	tons/yr
Total PM10/2.5	TPM2.5	27	tons/yr	[1]	2	tons/yr	[4]	0	tons/yr	[5]	29	tons/yr
Sulfur Dioxide	SO2	2	tons/yr	[1]	0	tons/yr	[4]	0	tons/yr	[5]	2	tons/yr
Carbon Dioxide	CO2	430,326	tons/yr	[1]	10,340	tons/yr	[2], [4]	1,138	tons/yr	[5]	441,804	tons/yr
Methane	CH4	31	tons/yr	[1]	1	tons/yr	[2], [4]	0	tons/yr	[5]	32	tons/yr
Nitrous Oxide	N2O	11	tons/yr	[1]	0	tons/yr	[2], [4]	0	tons/yr	[5]	11	tons/yr
CO2 equivalent	CO2e	434,303	tons/yr	[3]	10,436	tons/yr	[3]	1,148	tons/yr	[3]	445,887	tons/yr

Tbl 5 [1] Estimates based on the following: E (tons/year) = EF * Annual Avg Natrl Gas Usage / 2000 * No. of Units

Tbl 5 [2] For GHG emissions from start/stop cycles, the max. heat input capacity was divided by 2 to estimate the average heat input during a ramp up and ramp down during the cycles.

Tbl 5 [3] CO2e based on US EPA, Code of Federal Regulations, Title 40, Part 98, Subpart A, Table A-1, as amended 11-29-13 (78 FR 71904), 100-Year Horizon Global Warming Potentials (GWP) of 28 for CH4 and 298 for N2O.

Tbl 5 [4] Estimates based on the following: E (tons/year) = EF * Hours/Cycle * Cycles/Year/Turbine * No. of Units / 2000

Tbl 5 [5] Estimates based on the following: E (tons/year) = EF * Gal./Year * Btu/Gal. / 1,000,000 / 2,000